THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXIV. No. 590.] LONDON, SEPTEMBER 1, 1874. [26TH YEAR.] Price 6d.

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Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and other OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
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J. R. and Co. are the original manufacturers of Wrought-Iron Gas Tubes and Fittings, and Inventors of the LAP-WELDED TUBES for Locomotive and Marine Boilers.
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Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
SUGAR, SALTPETRE, AND ALL KINDS OF PANS.
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J. & W. ROMANS, Consulting Gas Engineers and Coal Factors, of Edinburgh and London, CONTRACT for supplying any quantity of COAL and CANNEL.
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For the English Government, and for the Government of the Netherlands;
MAKERS OF THE DUPLICATE COPY
Presented by Her Majesty's Government to the French Government;
AND MANUFACTURERS OF
IMPROVED
DRY GAS-METERS,
Warranted to Measure correctly, and not to vary.
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G. G. and Co. have just received the only Medal awarded for Gas-Meters at the Vienna International Exhibition.

SILVER MEDAL, PARIS EXHIBITION, 1867.

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OLD HILL, near DUDLEY,

MANUFACTURERS OF

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FOR GAS, STEAM, & WATER, EITHER BLACK, GALVANIZED, OR ENAMELLED.

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GAS ENGINEERS, CONTRACTORS, IRON AND BRASS FOUNDERS,

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GASHOLDERS AND TANKS,

Retorts, Retort-Fittings, Condensers, Scrubbers, Purifiers, Station-Meters, Governors, Rack and Screw Valves. Gas and Water Mains always in Stock.

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Including Chandeliers, Pendants, Hall Lamps, Brackets, Star and Sun Lights of all designs.

WET & DRY GAS-METERS,

Combining most recent improvements in principle and manufacture; upwards of 200,000 already in work, giving highest satisfaction.
(A guarantee of five years given with every Meter.)

PLUMBERS WORK, including Lift and Force Pumps; Cocks for Gas and Water and Steam; Brass Fittings.

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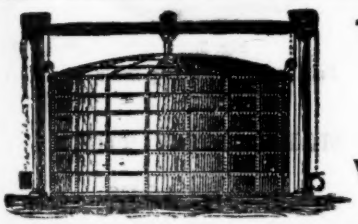

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REFERENCES TO UPWARDS OF 300 GAS-WORKS.

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Manufacturers of

IMPROVED CONSUMERS WET GAS-METERS

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The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

JOHN WILLIAM O'NEILL, SAMUEL H. JOHNSON, } Joint Managing Directors.

WARNER AND COWAN'S SELF-REGULATING GAS-METER.

PRACTICALLY UNVARYING MEASUREMENT WITH VARYING WATER-LINE.

Upwards of 60 cubic inches of Water may be withdrawn from a 3-light non-fountain Meter, and Registration not lessened.

Fig 1.
Front View of Drum, with hollow Cover removed.

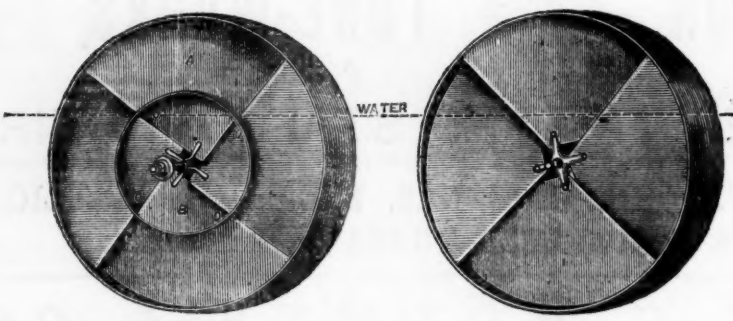

Fig. 2.
Back View, same as Ordinary Meter.

Fig. 3.
Back removed, showing Inner Drum.

BY LETTERS PATENT
FOR
GREAT BRITAIN,
FRANCE,
AUSTRIA,
PRUSSIA,
BELGIUM,
AND THE
UNITED STATES OF AMERICA.

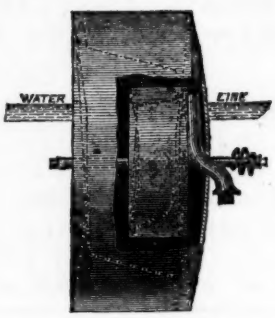

Fig. 4.
Side View, partly in Section.

MORE THAN THE ADVANTAGES OF COMPENSATING METER,
WITH
SIMPLICITY OF COMMON METER,
AND
INCREASED RANGE OF FLOAT.

DESCRIPTION.

The measuring portion of the ordinary Wet Meter drum, when in action, is but an annulus, varying in its capacity with the water level.

In the "PATENT SELF-REGULATING DRUM," one-half of this annulus, A, is made rigid and unvarying by the insertion of the smaller measuring-drum, B, which is of similar construction to the large one, but with its chambers so arranged that its inlet-hoods, *i i i i*, fig. 3, are within the chambers of the latter, and its outlet-hoods, *o o o o*, fig. 1, within its cover.

The quantity of gas discharged at each revolution is practically the contents of the annulus, A, bounded by a circle corresponding with the periphery of the small drum, because the gas contained between the water-line and that point (in the portion of large drum which the small one does not occupy) passes into the latter, and is returned under the cover to be remeasured, along with the supply entering by the spout.

It follows that any alteration of the water-level will affect both drums equally, and make no practical difference in the quantity passed. The lights also will be found quite steady, and the difference of pressure between inlet and outlet practically the same as in the ordinary Wet Meter. Large Meters also can now be made *with* floats.

SOLE LICENSEES AND MANUFACTURERS:

W. & B. COWAN,

ESTABLISHED 1827,

KING HENRY'S WALK,
BALL'S POND ROAD,
NEAR DALSTON JUNCTION STATION.
LONDON, N.

BUCCLEUCH ST. WORKS,
EDINBURGH.

FOR RESULT OF TESTING, SEE OPPOSITE PAGE.

WARNER AND COWAN'S SELF-REGULATING GAS-METER.

Certificate by Mr. G. MILLS,

METER INSPECTOR TO THE METROPOLITAN BOARD OF WORKS.

Meter Inspector's Office, St. Ann's Street, Westminster, S.W., Aug. 7, 1874.

GENTLEMEN,—The 3-light Patent Wet Meter sent to this office has been tested by me at ·5 and 1·0 inch pressures, and at the extreme range of the water-lines I find only a difference of 0·62 per cent. in its registration.

I am, Gentlemen, yours obediently,
G. MILLS.

Messrs. Cowan.

Certificate by Mr. G. DETHRIDGE,

METER INSPECTOR TO THE METROPOLITAN BOARD OF WORKS.

Meter Testing Office, Southwark Street, London Aug. 13, 1874.

GENTLEMEN,—I have submitted the 3-light Wet Meter (Warner and Cowan), No. 86, Self-regulating Drum, to the following tests, 18 feet per hour passing through the meter at each test, viz.:—At ½-inch pressure, with the water filled up to the overflow of the waste-box, then at 1, 1½, 2, 2½, and 3 inches pressure. One half-pint of water was drawn off, and the tests repeated; a second half-pint was drawn, and the tests repeated; a third half-pint was drawn off, the tests again repeated; and a fourth half-pint was taken out, with a repetition of the tests.

The results were carefully noted, and a second series of tests were carried out, confirming the original experiments.

The results are appended.

Rate per Hour, 18 *Cubic Feet*.

Pressure.	At High Water Level.	With Half a Pint off.	With One Pint off.	With One and a Half Pint off	With One Quart off.
5-10ths.	0·20 fast	0·30 fast	0·80 fast	0·60 fast	0·60 fast
10 ,,	0·40 ,,	0·20 ,,	0·20 ,,	correct	0·20 slow
15 ,,	0·20 ,,	correct	correct	,,	correct
20 ,,	0·40 ,,	0·60 fast	0·40 fast	0·40 fast	0·40 fast
25 ,,	0·40 ,,	correct	correct	0·20 slow	correct
30 ,,	0·20 ,,	,,	0·20 slow	correct	,,

Messrs. W. and B. Cowan.

G. DETHRIDGE.

Certificate by Mr. HENRY AIREY,

METER INSPECTOR TO THE METROPOLITAN BOARD OF WORKS.

Meter Inspector's Office, White Lion Street, Shoreditch, Aug. 21, 1874.

Gentlemen,—I beg to say I have tested the 3-light Wet Meter (Warner and Cowan's Patent) under various conditions, as stated below, as also the results.

I am, Gentlemen, yours obediently,
HENRY AIREY, Inspector.

Rate per Hour, 18 *Cubic Feet*.

Pressure.	High Water Line.	Two Gills off.	Four Gills off.	Six Gills off.
5-10ths.	0·80 fast.	0·20 fast.	0·40 fast.	0·60 fast.
10 ,,	0·80 ,,	..	..	..
15 ,,	0·80 ,,	..	..	..
20 ,,	0·80 ,,	..	..	..
30 ,,	0·80 ,,	..	..	0·60 fast.
35 ,,	0·80 ,,	..	..	..

Meter passing 15 feet per hour at low water line with 3-10ths pressure, 1·01 fast.

The tests at variable pressures were only made at half water line, with one exception, it being a matter, in my opinion, of no moment, as any difference would be the result of either an increase of speed or incorrect observation.

Each of these experiments were made repeatedly, with the same results.

Messrs. W. and B. Cowan.

Certificate by Mr. H. SPORNE,

METER INSPECTOR TO THE CITY OF LONDON.

City of London Gas-Meter Inspector's Office, Lower Whitecross Street, London, E.C., Aug. 20, 1874.

Gentlemen,—At your request I have tested your new Wet Meter, and I herewith hand you the results, which are very pleasing.

I am, Gentlemen,
Yours obediently,
H. SPORNE.

Messrs. W. and B. Cowan.

Test of 3-Light Warner and Cowan's Patent Meter, Passing 18 Feet per Hour at Each Test.

Pressure.	At High Water Line.	With Half a Pint of Water off.	With One Pint off.	With One and a Half Pint off.	With Two Pints off.
5-10ths.	0·00	0·00	0·00	0·20 slow	0·60 slow
10 ,,	0·00	0·20 slow	0·20 slow	0·30 ,,	0·60 ,,
20 ,,	0·00	0·40 ,,	0·40 ,,	0·00	0·60 ,,
30 ,,	0·00	0·60 ,,	0·40 ,,	0·00	0·80 ,,

The lights in each were firm and steady.

Certificate by Mr. B. M. M'CRAE,

ENGINEER TO THE DUNDEE GAS COMMISSIONERS.

Dundee Gas Commission, Engineer and Manager's Department, Dundee, Aug. 10, 1874.

Gentlemen,—We received sample meter, Warner and Cowan's Patent 3-light, which we have subjected to several tests, of which the following are the results:—

Pressure.	True Water Line.	Seven Gills off.
5-10ths.	1 per cent. fast.	1 per cent. fast.
10 ,,	1 ,,	Net.
20 ,,	Net.	1 per cent. fast.
30 ,,	Net.	1 ,,

These results are very satisfactory, and prove that said meter, so far as I am aware, surpasses anything that has hitherto been produced.

I am, Gentlemen, yours, &c.,
B. M. M'CRAE.

Messrs. W. and B. Cowan.

Certificate by Mr. R. FERRIER,

METER INSPECTOR, EDINBURGH.

Inspector of Meters Office, City Chambers, Edinburgh, Aug. 13, 1874.

Gentlemen,—I herewith beg to append the results of my testing from the 8th inst. to this date, 5-light No. 183,127, Warner and Cowan's Patent Drum *non-Fountain* Gas-Meter.

These are the average results of many experiments which, I must say, varied very little.

I find that the meter supplies its full quantity, and the valve does not close until upwards of 14 gills of water are extracted.

Capacity per Revolution ·25 *Cubic Feet per Hour*, 30 *Feet*.

Pressure.	When filled with Water to Overflow.	Four Gills off.	Eight Gills off.	Twelve Gills off.
0·5 in.	0·5 fast.	3·3 slow.	0·2 fast.	0·5 fast.
1·0 ,,	0·6 ,,	0·4 ,,	Net.	0·3 ,,
2·0 ,,	0·5 ,,	0·2 ,,	0·4 fast.	0·5 ,,
3·0 ,,	0·5 ,,	0·2 ,,	Net.	0·5 ,,

R. FERRIER,
Chief Inspector of Meters, Edinburgh.

Messrs. W. and B. Cowan.

Certificate by Dr. WALLACE, F.R.S.E., F.C.S.,

GAS EXAMINER FOR THE CITY OF GLASGOW.

Chemical Laboratory, 42, Bath Street, Glasgow, Aug. 3, 1874.

I have made a careful examination of a 3-light Warner and Cowan's Self-regulating Gas-Meter, and I have no hesitation in saying that it is the most perfect meter that has come under my notice. The construction is beautifully simple, and the works are not more liable to accidental derangement than those of the common wet meter. While an ordinary 3-light meter gave a variation in the registration of 5 per cent. when tested at the high and low water levels, with a difference of 3½ gills of water, the patent meter, with a difference of 7½ gills, or 62·8 cubic inches in the quantity of water, varied in the registration only 0·2 per cent. These tests apply to the ordinary half-inch pressure at which meters are tested according to Act of Parliament, but an increase to a working pressure of 3 inches gave results equally favourable to the patent meter. The common wet meter showed a variation in the registration by the increase of pressure of 1 to 1·5 per cent., according to the level of the water, while the self-regulating meter gave a variation resulting from the increase of pressure of ·6 at the high level to 1 per cent. at the low level. The greatest error at any pressure and any level of water was, with the common meter, 3·8 per cent., and with the patent meter ·8 per cent.

The following is a statement of the various trials to which the patent meter was subjected:—

Pressure.	Highest Level.	Two Gills off.	Four Gills off.	Six Gills off.	Seven and a Quarter Gills off
Half an inch . .	0·8	0·4	0·4	0·8	0·6 fast.
Three inches . .	0·2 fast	..	..	..	0·4 slow.

Such extremely accurate performance, combined with such an extensive variation in the quantity of water, leaves nothing further to desire in the measurement of gas.

WILLIAM WALLACE.

ALDER AND MACKAY,

GRANGE WORKS, EDINBURGH,

MANUFACTURERS OF

CONSUMERS IMPROVED GAS-METERS;

IMPROVED DRY GAS-METERS, in Cast Iron and Tin Cases,

OF THE HIGHEST EXCELLENCE,

Warranted to measure correctly, and not to vary.

STATION METERS AND GOVERNORS,

EXPERIMENTAL METERS, PHOTOMETERS, GASHOLDERS, &c.

WILLEY AND FORD,

GAS ENGINEERS,

WORKS: COMMERCIAL ROAD, EXETER,

INVITE THE ATTENTION OF GAS COMPANIES AND OTHERS FOR THE SUPPLY OF

EVERY DESCRIPTION OF GAS APPARATUS.

ENGINEERING DEPARTMENT.

NEW GAS-WORKS erected complete. Plans and Estimates furnished. MAINS, METERS, SERVICES, LAMPS, &c., adapted for Towns of any size. Gas Companies advised on Improvements, Extensions, and Alterations of Works.

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RETORTS and RETORT-HOUSE FITTINGS, CONDENSERS, SCRUBBERS, ENGINES and EXHAUSTERS, PURIFIERS, STATION-METERS, GOVERNORS, VALVES, &c.

METER DEPARTMENT.

They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

GAS-FITTING DEPARTMENT.

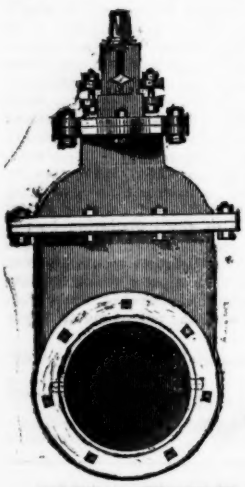
An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS, MEDIÆVAL FITTINGS for CHURCHES, &c.

PATTERN-BOOKS and PRICE LISTS furnished.

☞ PLEASE NOTE THE ADDRESS—

GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER.

C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves are superseding the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

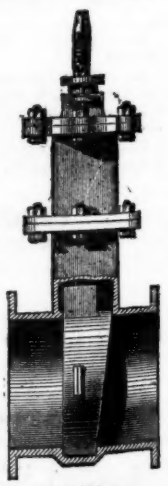
They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.



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PURIFIERS, SCRUBBERS, CONDENSERS of most Improved Description.

WOOD SIEVES FOR PURIFIERS,

Which have now been in use for more than ten years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS, DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

TANGYE BROTHERS AND HOLMAN,

LAURENCE POUNTNEY LANE, LONDON, E.C.,

SOLE MAKERS OF

MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH

HOLMAN'S PATENT ECCENTRIC FASTENINGS & ANTI-FRICTION CATCHES.

OVER 10,000 IN USE.

NO LUTING.

LIDS HINGED TO MOUTHPIECES; NO LIFTING ON OR OFF.

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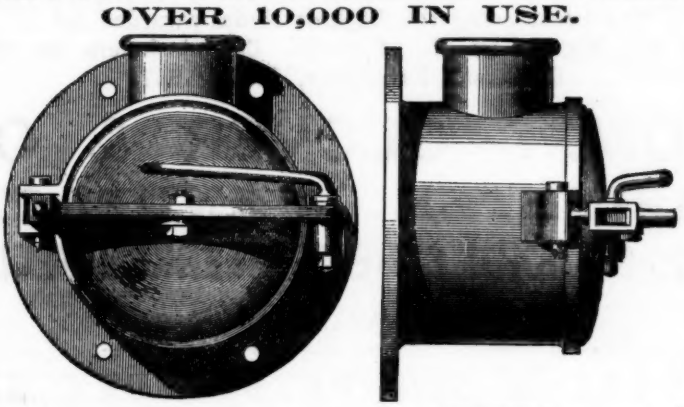

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SIMPLE.

ECONOMICAL.

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NO DUPLICATE LIDS REQUIRED.

These Lids are proved by many eminent Gas Engineers to be the most efficient, saving much time, labour, and expense; are opened and closed as quickly and with as little trouble as an ordinary furnace door, and by their use the Retorts are soundly sealed during the whole period of carbonization.

These Lids are Adopted by the following (among many other) Gas Companies:—

The Gaslight Company, Beckton (where over 2000 are in use).	The West Ham Gas Company.	The Salford Corporation Gas-Works.	The Carmarthen Gas-Works.
" Gaslight Company, Bow Common.	" Imperial Gaslight Company.	" Rochdale Corporation Gas-Works.	" Merthyr Tydfl. Gas-Works.
" London Gaslight Company.	" Gas-Works, Arsenal, Woolwich.	" Liverpool United Gas-Works.	" Ystrad Gas-Works.
" Independent Gaslight Company.	" Commercial Gas Company.	" Birkenhead Gas-Works.	" St. Alban's Gas-Works.
" Phœnix Gaslight Company.	" Alliance and Dublin Gas-Works.	" Birmingham Gas-Works.	" Over Darwen Gas-Works.
" South Metropolitan Gaslight Co.	" Edinburgh Gas-Works.	" Nottingham Gas-Works.	" Aylesbury Gas-Works.
	" Manchester Corporatn. Gas-Works.	" Newcastle-on-Tyne Gas-Works.	" Cardiff Gas-Works.

The Morton's Lid is made circular in form, that being the most convenient and suitable shape. It can be used for Retorts of any section, by adapting the Mouthpiece casting from the D, oval, or other shape, at the back, to circular in front.

The following important Testimonial has been given:—

THE GASLIGHT AND COKE COMPANY

(Commonly called the Chartered Gas Company),

BECKTON, NORTH WOOLWICH, July 2, 1874.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—In answer to your inquiry respecting the Self-Sealing Lids, I beg to say that they continue to work well, and I have every reason to be satisfied with them.

I should be very sorry to return to the old system of Luting, and our stokers here freely acknowledge the benefit to them of the new system.

I am, yours truly,

(Signed) G. C. TREWBY.

P.S.—We shall have very shortly about 3000 of your Lids in use.

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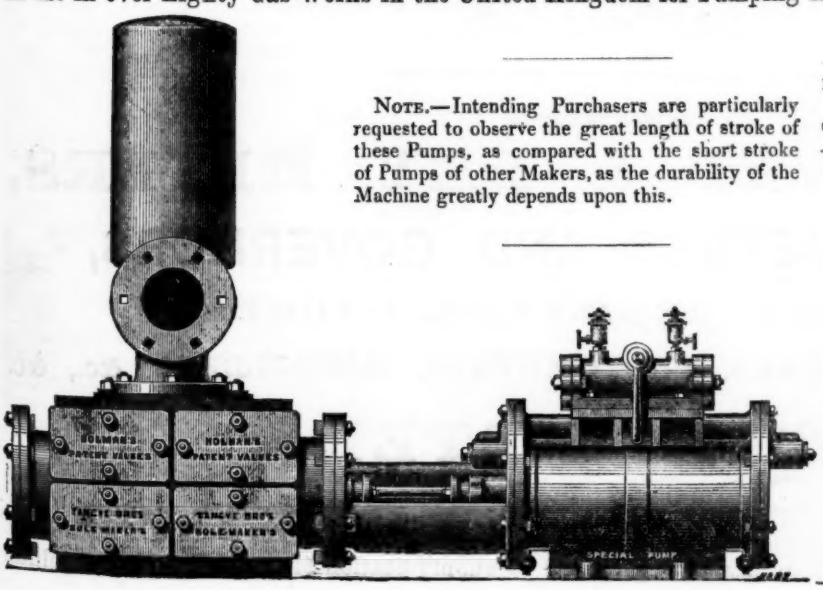
THE "SPECIAL" DIRECT-ACTING STEAM PUMPS.

Nearly 4000 have been sold since their introduction in 1867.

In use in over Eighty Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.



NOTE.—Intending Purchasers are particularly requested to observe the great length of stroke of these Pumps, as compared with the short stroke of Pumps of other Makers, as the durability of the Machine greatly depends upon this.

The following are a few of the leading Sizes:—

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons per Hour, Approximate.	Price.
3	1½	9	550	£16
4	2	9	970	18
3	3	9	2,200	18
4	3	12	2,200	20
6	3	12	2,200	25
4	4	12	3,900	25
6	4	12	3,900	30
6	5	12	6,100	35
7	5	12	6,100	40
8	5	12	6,100	45
6	6	12	8,800	40
8	6	12	8,800	50
7	7	12	11,900	50
10	7	12	11,900	65
8	8	18	15,660	65
10	8	18	15,660	75
10	9	24	19,800	90
12	9	24	19,800	110
10	10	24	24,400	100
14	10	24	24,400	140
12	12	24	35,240	140
21	12	36	35,240	285
14	14	24	47,960	180
26	14	48	47,960	450

London 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

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PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

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9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

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MANUFACTURERS OF

PATENT WET & DRY METERS,

STATION-METERS AND GOVERNORS,

PRESSURE REGISTERS, GAUGES,

EXPERIMENTAL METERS, PHOTOMETERS, GASHOLDERS, &c., &c.

WATER METERS.

W. P. & Co. beg to state that they are now prepared to supply Station-Meters with planed joints.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 1, 1874.

Circular to Gas Companies.

The vestrymen of St. Pancras, last Thursday, inaugurated, with some ceremony, the system of lighting their parish on the average meter indication plan. As our readers know, the vestry of Paddington have also adopted the same system, but it has not yet been brought into operation in that parish. Since the plan has given satisfaction to both company and local authority in almost every place in which it has been adopted, we may reasonably anticipate a similar favourable result in the case of these two important metropolitan districts. We have before expressed a confident opinion that, under this system, the company, in the end, will experience no loss. There may be a diminished consumption of gas, but the company will have the satisfaction of knowing that all consumed is paid for. Under the contract system, we have reason to believe there is more often than not an enormous waste. Our experience has been that, for every lamp consuming less than the amount of gas contracted for, there is at least one other in which a much larger quantity is burned. We have, in fact, grave doubts about the profits arising from public lighting contracts, and, if the receipts be smaller under the new arrangement, we believe the ratio of gain will be greater.

The vestry of St. Pancras have decided on a consumption of 4·6 feet, in place of 5 feet per hour, and intend to shorten the hours of burning, but to what extent is not reported. There is no doubt that, during the summer nights, a great deal of gas is burned to waste; but, on the other hand, in the winter months, and under the contract system, the rigidly fixed hours are a public disadvantage. The hours, in fact, should be left to the discretion of an intelligent and responsible superintendent, who should have power to shorten them in summer and lengthen them in winter, as circumstances allowed and required. Whether the saving estimated for the parish will be realized, without complaints on the part of the public, depends on several circumstances. The vestry are placing themselves partly in the position of the gas company, and they must not be surprised if some of their proceedings excite discontent.

We notice that one of the speakers at the inaugural ceremony was a member of the Metropolitan Board of Works, who took occasion to tell his hearers that the Board intended to ask for powers to make gas for the whole of the metropolis. He admitted that he did not suppose the present Parliament would grant such powers, but he said he thought the application would have a good effect on the gas companies. The application will cost the ratepayers of the metropolis several thousands of pounds, and we think that with free admission on the part of a majority of the Board that they have no chance of success, the ratepayers may ask whether the Board are justified in throwing the money away on parliamentary amusement. The City of London Gas Act cost the Corporation, if we remember rightly, £8000, and there is probably now no member of the Corporation or of the Board of Works who does not regret that the Act was ever passed.

It would be difficult to say whether malice or ignorance most predominates among the opponents of the gas companies. A perusal of our weekly contemporaries affords a remarkable illustration of both. In one paper it is written: "Until the last few "years the public had no idea of the mysterious juggling of gas "companies; a foot of gas was considered like a pint of beer or "a slice of bread—the same everywhere. It turns out that gas "can be diluted to such an extent as to deceive the buyer, in- "crease the quantity consumed, and, of course, cause the bill to "swell out in like proportions." This statement is purely malicious, for the writer of it well knows that he is making a wilful misrepresentation. Another more pretentious journal, *à propos* to the proposed application of the Metropolitan Board, writes as follows: "The proposed position of the Metropolitan Board of "Works has already been anticipated both in respect of water "and gas by the corporations of many of our chief provincial "towns, as, for example, Glasgow, Manchester, Leeds, Liverpool, "&c., and many others are following the example which these "have given." We need hardly repeat that there is no instance in which a Corporation has been allowed to set up a competing undertaking as the Board of Works propose. At Glasgow and Leeds the gas undertakings were bought up. Liverpool is still supplied by a company, but at the next meeting of the Town Council some proposal for the purchase of the undertaking is to be taken into consideration. The case of Manchester, which is quoted by every one who abuses a gas company, is so little understood, that we propose in an early number to give a succinct history of gas affairs in that city, which will probably dispel some prevalent illusions.

The Town Council of Exeter seem desirous of relieving the gas company of all anxiety respecting purification, by prescribing the exact mode to be followed. We have before mentioned complaints of a stench in that city, which is alleged to be caused by the use of lime for purification. The manager of the company denies that lime is the cause of the offence, but at the same time, in deference to the wishes of the Town Council, offers to change his process, and use two oxide purifiers and one lime purifier. That, however, will not satisfy the council, who at a recent meeting "resolved to inform the gas company that the council cannot "accept the responsibility which apparently the gas company desire "to throw upon them, of directing the precise means of purifi- "cation, or otherwise, which the company shall adopt as a remedy "for the evil complained of, but they request the company to at "once desist from using a purifier entirely charged with lime, and, "so far as lime is necessary, to use it only above the oxide of iron, "and that very sparingly, and with an ample supply of oxide below; "but the council make the request without prejudice, and will in- "struct their surveyor to inspect the works within the current week." By laying down these instructions, it appears to us that the council do to the full adopt the responsibility of directing the precise means of purification. We hope they will be satisfied with the results of using lime "very sparingly" above oxide of iron.

A little difference between the Town Council of Southampton and the gas company about the price of gas for public lamps has led to the appointment of a committee of the council to take into consideration "the question of the board taking steps "to supply the town with gas, and to report thereon." This is a somewhat vague reference, but it probably points to a proposal for the purchase of the company. If so, well and good. But if the council are indulging the hope that they will be allowed to set up a competing undertaking, they may disabuse themselves of the notion at once. If they are thinking of making a compulsory purchase, we may refer them to Ryde for advice on the matter.

The Town Council of Tamworth appear to be in arrears with the gas company for the cost of the supply to public lamps, and as the present agreement is about to expire, the company have

given notice that they will require a new, and we should think more stringent, one, under a threat to stop the supply if the agreement be not entered into. It is not reported that an advanced price is demanded; the company would seem only to require regular payment. The council stand on their dignity, and resolve—

That as they are not seeking for any special terms, which would render a special agreement necessary, they require the gas company to supply gas to the town in accordance with the general and special Acts.

We do not remember the provisions of the Tamworth special Act, but we think the Town Council will find that they have no power to compel a supply except under special contract.

An important rating case, which has been pending between the parish of Liverpool and the gas company for two years, was decided by the Recorder last week. For 12 years, and up to 1872, the assessment stood at £12,000. It was then raised to £19,000, and the company appealed, contending that the rateable value of their property was only £11,555. The case was, by consent, referred to Mr. Hunt, to find facts and figures for the decision, and he has reported the rateable value as £19,415. We hope to obtain a copy of Mr. Hunt's report, which may have considerable importance while the present uncertain mode of settling assessable value continues to exist.

The reports of the half-yearly meetings of gas companies in different parts of the country show, on the whole, the condition of our industry to be in a very satisfactory state. At Belper, Cardiff, Lewes, Reading, Wakefield, and Wolverhampton full dividends have been declared, and in only one instance has it been necessary to make a draw on the reserve-fund. At Eastbourne, only 7 per cent. is paid for the past half year, but better results are confidently anticipated for the next. The Partick, Hillhead, and Maryhill Gas Company undersell the Corporation of Glasgow in part of their district, and therefore cannot expect much profit; but they are able to divide 5½ on preference shares and 2½ per cent. on ordinary shares.

We had no intention of making the case of the Barnet District Company worse than it is, and therefore regret that by a misprint, unfortunately overlooked, the profit on the water undertaking was stated in our last to have been £7 16s., when it ought to have been printed £71 16s. The report of the half-yearly meeting, to be found in another column, will be read with interest, if not with amusement. It certainly does seem remarkable that with an "administration of all the talents," as the directorate may well be styled, the affairs of the company should have fallen into their present condition. With a most distinguished geologist and meteorologist on the board, they sink a well which yields no water, and with gentlemen of great experience in everything relating to gas undertakings, they—well, they do not make a dividend. We lay no blame on the directors. The Fates are against them at present; but we have no doubt there are better days in store for the shareholders. Let them possess their souls in patience, and let the directors take to heart the remarks of Mr. George Livesey.

We have received from our Paris correspondent a full report of the proceedings of the first meeting of the Société Technique de l'Industrie du Gaz en France. There is a suggestive paper by M. Servier "On Several Questions of Importance in Gas Industry," which we may translate in full; but, for the rest, the letter of our correspondent previously published, gives a sufficient account of the meeting. Our object now is to notify to our readers that a copy of this report will be sent to any one of them on application to M. Albert Ellissen, Secretary to the Society, 21, Rue Abbatucci, Paris, to whom also requests for admission to the society must be addressed.

Water and Sanitary Notes.

Mr. Bramwell's address to Section G of the British Association, which we publish in another place, will be read with all the respect commanded by so eminent an authority. With all he says concerning the advantages, sanitary and other, of a constant over an intermittant supply of water we completely agree. But we cannot help thinking that the speaker was too hard on the metropolitan companies. Let people say what they will, London is now admirably supplied with water. Frightful as the consequences of the foul air pollution of cisterns are said to be, the metropolis is still the healthiest city in the world; and if all alleged is true, there is as much danger in the milk-can as the water-cistern. Indeed, whenever typhoid fever now breaks out, the source of the milk will require as complete an investigation as the condition of the water-cistern. Irresponsible men fail altogether to appreciate the vastness of the interests at stake in this huge metropolis. If we suppose a constant supply of water turned on with inefficient appliances, there can be no doubt that our sources, adequate as they are, would be quickly drained, and a serious drought would be the result. The responsible engineers of the companies know this well, and hence they contended successfully for regulations which are no doubt, in a certain sense, "oppressive," but which we regard as absolutely necessary for the public safety. Mr. Bramwell may be right when he objects to the retention of the cistern if the fittings be efficient; but, even in such a case, a cistern full of water would be a valuable store in the event of an accident to a street-main or at a pumping-station. We have said before that a constant supply is being brought about in the best of all ways—gradually. London is not like Norwich, Sheffield, or Manchester, and it has taken years to get these comparative villages successfully under the constant system. The London companies are doing their best. The Metropolitan Board of Works, if they took over the works to-morrow, could do no better. Let us leave the companies unhampered by ill-judged and unfriendly criticisms, and with honest support from local authorities and those most concerned—the general public—London may, in the course of a very few years, receive the blessing of a constant supply of water. The waste-detecting meter of Mr. Deacon obtained no more than due praise from Mr. Bramwell. The use of this instrument and the plan of districting ought to be adopted wherever a constant supply is furnished. Abundant as water apparently is in this country, we have none to waste, especially when the cost of collection and storeage is great.

Notwithstanding a considerable fall of rain, there is still a serious dearth of water in many parts of the country, and especially in purely rural districts. In parts of Bucks and Hertfordshire the people have to go miles from home for water. Under these circumstances, Mr. Bailey Denton's plans for storing water for villages deserve the attentive consideration of rural sanitary authorities. Fortunately, or it may be unfortunately, these droughts generally come at distant intervals, and a wet winter will cause the lesson of this spring and summer to be entirely forgotten.

Sewage, it is unnecessary to say, continues a difficulty everywhere. Barnsley has been ordered to "utilize" its sewage; but the question is, how to do it. They have, it would appear, called in Major-General Scott, who will clarify their sewage with lime, and burn the deposit into something which, by *une façon de parler*, is called cement. Members of the Corporation have also witnessed some experiments with an *aqua mirabilis* from Leeds, which costs only 1d. per gallon, and which would appear to have a wonderful efficacy in purifying sewage. At Hertford, the deodorizing works seem to have proved a failure, and the Corporation are threatened with proceedings at the instance of the Lea Conservancy Board. The works at Hertford, it is said, are about to be taken over by the Phosphate Sewage Company, who may (if, by the way, they get their material) clarify sewage very effectively, but we have grave doubts about the value of phosphate of alumina as a manure. Complaints are also made, by a fussy medical officer of health, of the condition of the Lea at Tottenham; but the conservators of the river, well knowing the difficulties the Local Board have had to contend with, and the efforts they have made to avoid nuisance, have very properly refused to take action in the matter.

The utter confusion which exists among sanitary authorities is well illustrated by the case of the Darlington Town Council and the Darlington rural sanitary authority. Some energetic members of the latter Board are anxious to take action against the former, for polluting the rivers Tees and Skerne. Their solicitor, however, advises them that they must go into court with clean hands, and reminds them that Cockerton, which is within their jurisdiction, sends its sewage into the Skerne. The result is that the Board resolve to do nothing. In the course of the discussion a member of the Board advanced the extraordinary opinion that the cost of any action to cleanse the rivers should fall on the riparian proprietors interestsed, and not on the great body of ratepayers who pollute the rivers. We do not expect that any court of law would endorse the opinion of this worthy gentleman.

In Hampshire, drainage difficulties are springing up in all directions. The Local Government Board are driving the authorities at Winchester to do something, and, through Mr. Harrison, suggest clarification, deodorization, and irrigation, or intermittent filtration, which must involve the city in great expense. At Southampton the difficulty of draining a level district has been fully experienced, and now a councillor suggests the application of Captain Liernur's system to the town. We should not object to see this plan have a fair trial in this country, but doubt whether Southampton is exactly the right place in which to make the experiment. Some northern town on the midden system would be a better locality.

The proceedings at a public meeting of the inhabitants of Petersfield, to take into consideration the drainage of the town, so accurately reflect the opinions of the inhabitants of most small country towns on the subject, that we quote them at some length:—

The mayor, in opening the proceedings, said he had been surprised to hear such a character of the town. He had lived there above 50 years, and his im-

pression had been that it was a nice sweet little town, but he was now told to the contrary. He did not give an opinion one way or another, because he was not competent; but they must remember that drainage meant drainage of the pocket as well as of the town, and that drainage also meant a large outlay for a water supply. They would have, too, to take their sewage somewhere, and to get their water somewhere. For depositing their sewage he had no doubt they would have a *mandamus* or an injunction. When once they began they would never know where they stopped. A year or two ago the guardians were appointed the Sanitary Board, and they were told they must act. So far from that being so, at Horndean the guardians tossed the paper they received into the fire, and did nothing. At Petersfield they had spent hundreds, and they were none the better for it. They appointed sanitary officers—conscientious men, who did not like to take the pay without doing the work, and they had hunted about for every nuisance they could find. It was for the meeting to say whether they were nuisances, and, if so, whether they would get rid of them.

The medical officer of health then read a report, which clearly showed that all the inhabitants are in danger of being poisoned by foul air and fouler water. In the end, a resolution postponing the consideration of the question altogether was carried almost unanimously. We shall see what the Local Government Board will do in this case.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

XXVIII.

Carbonization.

As is well known, fuel, such as coal, wood, peat, &c., is composed of carbon, hydrogen, oxygen, and nitrogen, with mineral matter. When heat is applied to fuel, the resulting changes in the case of an open fire depend on the quantity of air admitted and the temperature thereby generated. Thus, with a small access of air, and, consequently, low temperature, a smouldering fire is produced, giving a large quantity of smoke, and comparatively little gas. But, when air is freely admitted or the draught urged, a greatly elevated temperature is produced, and the combustible portion of the fuel is entirely converted in gases, leaving nothing but mineral matter or ash behind.

When, however, such fuel is heated without access of air (as in a retort), the results are very different. In this case the compounds—gases and vapours—produced, are solely derived from the material exposed to heat, and vary according to the composition of that material and the temperature to which it is exposed. Thus, with wood, which contains relatively much oxygen and hydrogen, we obtain mainly carbonic oxide and marsh gas, with acetic acid and methylic alcohol, known as wood spirit, with a residuum of charcoal. In the case of coal, with a much larger proportion of carbon in relation to hydrogen and oxygen, we obtain chiefly gaseous and vaporous compounds of carbon and hydrogen, with carbonic oxide, the relative proportions of these bodies varying with the temperature. In either case, the final result of what we call destructive distillation is a residue of carbonaceous matter in the retort (charcoal in the one case and coke in the other), and hence the distillation of fuel in close retorts has come to be known as the process of "carbonization."

The great importance of successful carbonization has already been alluded to; and, when the operation is not carried out with all due regard to economy, the success of any undertaking must suffer accordingly, for on this, in a great measure, depends the economy of coal used in the production of gas; the quality of that gas as an illuminating agent, and its comparative purity; the quantity and quality of coke available for sale as a residue; the expenses of labour; and, lastly, the wear and tear of retorts and settings; all points of the most serious consideration to the gas manufacturer, and on which mainly depends the question, of profit, or loss, to a gas company.

As already hinted, the most important consideration, is the degree of heat to which the coal is submitted during the operation of carbonization; for, should this be extremely low, then tar will be produced in abundance, with but a small quantity of gas. Should the heat be too high, then a portion of the rich hydrocarbons in the gas will be decomposed, and carbon deposited in a solid state on the interior of the retorts, or in the incandescent coke contained therein, thereby reducing its illuminating power. And should the operation be too protracted, by retaining the coke within the retorts after the useful illuminating gas is evolved, then a most troublesome and obnoxious impurity is formed by the sulphur in combination with the coke; and, as our every-day experience teaches us when burning that fuel in private dwellings, this sulphur, with its pernicious qualities, is obstinately retained by the coke to the last.

The means of estimating the various degrees of high temperature by pyrometers, as at present constructed, can hardly be regarded as satisfactory, therefore this most important question in carbonization becomes, to a certain extent, a matter of conjecture. We must, therefore, content ourselves by following such authorities as Kahn and Becquerel, by adopting their description of the various degrees of heat, by their colours, together with the melting points of some of the metals, to which we shall have occasion hereafter to refer.

600°	Fahr.,	faint deep red, just visible in a completely darkened room.
662°	,,	Mercury boils.
810°	,,	Antimony melts.
980°	,,	Faint red, seen under ordinary daylight.
1290°	,,	Dull red; colour of red oxide of iron.
1470°	,,	Bright red; colour of red oxide of lead.
1650°	Fahr.,	*Cherry red.
1830°	,,	*Bright cherry red.
1869°	,,	Brass melts.
1873°	,,	Silver melts.
1996°	,,	Copper melts.
2010°	,,	Dull orange.
2190°	,,	Bright orange.
2370°	,,	White heat.
2550°	,,	Bright white heat.
2786°	,,	Cast iron melts.

The practical man, by his continued experience, is able to determine by the eye, with tolerable accuracy, the principal degrees of temperature referred to in the table, and any person, on observing attentively a good ordinary house fire, will be enabled to distinguish six or seven of the distinct shades or degrees of heat, ranging from faint red, or 980°, which is discernible in ordinary daylight, to dull orange, 2010°, and sometimes bright orange, 2190°, according to the degree of heat the various parts of the fuel have acquired; which observation we recommend, in order to understand the different degrees of temperature alluded to in the foregoing table.

With iron retorts, the colour of the various degrees of heat is easily appreciated; but with those of clay, when viewed by daylight, the lower degrees of temperature are more difficult of being distinguished, in consequence of the light colour of the material composing the retort interfering with the colour of the heats. However, when the temperature becomes elevated, approaching towards the proper point for carbonization, this impediment no longer exists.

When coal is carbonized at a temperature corresponding with 600°—a degree of heat which is only visible in a completely darkened room, and then merely as a faint obscure red—its volatile parts are nearly all converted into liquids, as tar, or oil, and water, with the evolution of only a small portion of gas, equal to a few hundred feet per ton of coal, the coke remaining in the retort being of a soft, loose, friable nature; and in some kinds of coal a small portion of volatile carbon is retained, which cannot be expelled at that low temperature.

By this process the oil, or tar, from Boghead and other cannels, coals, shales, and similar bituminous substances, is obtained, which is afterwards purified and sold as paraffin oil.

In proportion as the heat of the retorts is augmented, so is the quantity of gas from a given quantity of coal increased; thus at a temperature approaching to 980° the yield from a ton of Newcastle coal is about 6000 feet. At this heat, there is no material accumulation of carbon on the interior of the retorts, and only the slightest deposit of carburet of iron on their exterior, even after 15 months of continuous operations; moreover, iron retorts, under such circumstances, undergo but little deterioration, as at the end of the period mentioned, when taken down, they are almost in as good condition as the first day they were set.

These facts came under the writer's notice at a new work, where the settings of retorts were so wretchedly defective that a higher degree of heat than 980°, could not possibly be attained, consequently a large portion of the coal was converted into tar, which, in the locality, was an unmarketable commodity, whilst the whole of the coke produced was required for heating retorts. Under these very unfavourable circumstances, the serious loss sustained by the company will be readily understood, and this loss caused our services to be called into requisition, when a remedy was applied by reconstructing the whole of the settings, from which time the operations of the company were successful.

If we still further increase the temperature of the retorts, we obtain an increased quantity of gas, with superior coke and less tar, and when about 1400° are reached, then a quantity approaching to 8000 feet per ton of Newcastle coal is obtained, and this gradually increases in quantity, with a slight diminution in quality, until arriving at the point at which copper melts, 1996°, or dull orange, 2010°, which, in our opinion, is the best heat for the production of gas and coke from caking coal. We are aware that engineers prefer a higher degree of heat, by which the coke becomes harder and brighter in appearance, generally; but our impression is, that this advantage for the coke, is obtained at the cost of the quality of the gas.

At all temperatures above 980°, a considerable portion of the olefiant gas is always decomposed, and carbon deposited in a solid state, in the interior of the retorts, which deposit is directly in proportion to the temperature, increased according to the pressure of the gas therein. On withdrawing the pressure by an exhauster, or other means, the evil, so far as regards pressure, is removed; but there still remains the accumulation of carbon occasioned by the high temperature, and the higher this is, the more rapidly is the carbon deposited, and the quality of the gas deteriorated in proportion. It has been supposed that this incrustation in clay retorts was effected by the material itself, or by its rough surface; this, however, is not the case, but is simply the effect of high heat and pressure, acting alike under like conditions, on iron as well as clay retorts, and would occur in a retort of glass, were it capable of attaining the necessary degree of heat.

This accumulation of carbon in retorts is prejudicial on several accounts; firstly, presenting as it does a large quantity of non-conducting material around them, which prevents the heat penetrating to the coal undergoing carbonization, thus increasing the quantity of fuel for the furnaces; secondly, the space occupied by it when attaining any degree of thickness, of necessity diminishes the capacity of the retort, so increasing the expenses of wear and tear and

* These terms are vague in the extreme, as the various kinds of this fruit, represent, in colour, all the different degrees of heat, from the lowest to the highest temperatures.

labour; thirdly, the coke when produced in contact with such accumulation, is always smaller, and, of course, less valuable, than when obtained in clean retorts; but the most important of its evils is the deterioration of the gas from which it is derived.

We have shown that, under extraordinary circumstances, the manufacture of gas can be carried on, without such incrustation on the retorts; but, for profitable and economical operations, it is an inevitable evil; it becomes an imperative duty, therefore, to employ all means to reduce this to a minimum, which we will endeavour to indicate.

From our own experience, we have found that, if this incrustation of carbon be allowed to accumulate beyond a certain limited extent, it then increases with remarkable rapidity; this was particularly conspicuous at the period when iron retorts were used, and before the employment of the exhauster. Then, with new retorts, it required five or six weeks to form any material quantity of carbon within them; but this once formed, it speedily accumulated in a most extraordinary manner, so that often after a retort had been in use three or four months, it was literally half filled with carbon throughout its length; and, as lately observed by a correspondent of the JOURNAL, a retort, which, when new, would receive a charge of 156 lbs. of coal, at the end of a few months was not of sufficient capacity for one-third of that charge. And to this deposit in iron retorts was mainly due their rapid destruction.

We are not aware of this subject having been hitherto noticed, and our statements may be regarded by some with a degree of doubt; to such we advise careful investigation, when it will be ascertained that in both kinds of retorts, and under all conditions of high heat and pressure, this rapid accumulation takes place, whenever allowed to pass a certain limit; it follows, therefore, that it should be removed before passing that limit, and before attaining any degree of importance, which is readily done by means of atmospheric air.

For this purpose, when the incrustation acquires a thickness of about ¼ inch or so, which generally occurs, under ordinary conditions of heat and pressure, in about five or six weeks, the retorts are left without charging for some 24 hours, the average time necessary for cleansing them, the damper being partially closed, and the heat kept up as usual. The doors are then placed, of course unluted, leaving a space of about ⅜ inch between the door and mouthpiece, when a current of air passes in at the bottom of the retort, the oxygen combines with the incrustation, and a current of the gases produced passes off at the upper part of the mouthpiece; and frequently particles of carbon, in an incandescent state, are seen to fly away. By these means the retort is cleared out, and rendered as free as the first day it was fixed. During the operation, the caps of the ascension-pipes are taken off, so that the current of heated air, in passing through, cleanses them. Should the retorts be of ordinarily good manufacture, there is not the slightest fear of either crack or fissure throughout their length, even at the end of two or three years operations, and supposing the cleansing to be periodically effected as described.

Some engineers may object to the supposed loss of one day's inaction of the retorts in every five or six weeks; but this loss is completely imaginary, for, by the system recommended and employed by the writer during many years, they are kept constantly practically clean, thus avoiding the serious disadvantages enumerated, which result from an accumulation of carbon, and a positive and most important gain is effected.

Another method of removing this carbonaceous incrustation is, according to Edge's patent, by the application of high-pressure steam, admitted by a tap, and conducted by a cast-iron pipe to that part of the retort where there exists the greatest accumulation. The steam rushing into the retort carries with it a portion of air, and by their combined action the carbon is speedily dissipated. Our experience does not extend to this means of cleaning retorts, but we are assured by engineers, who have had the process in action for some years, that it leaves nothing to be desired, as by it a coating of carbon an inch thick can be removed easily in three hours. In practice, however, it is applied for about an hour once in a month to each retort, this being sufficient to keep them perfectly clean, and is done at a nominal cost, with very little trouble, and we believe the process requires only to be more generally known, to be thoroughly appreciated.

In many gas-works this carbon is permitted to accumulate on the interior of the retort until attaining a thickness of from 1 to 2 inches, which, in ordinary working, occurs in about four or five months, when, with a chisel-bar, it is broken into pieces, and so detached from the retort; but, although this is practised in many extensive establishments, it is decidedly erroneous, injurious, and unprofitable, and, as we shall hereafter show, first-class clay retorts, set in the most economical and profitable manner would not be able to resist the action of the chisel-bar, but would be rendered utterly useless by it.

From what has been observed, it is indispensable, for economical and profitable operations, to reduce the pressure in the retorts to a minimum, which is accomplished by means of the exhauster. One or more pressure-gauges, in direct communication with the hydraulic main, should be placed in conspicuous places in the retort-house, as well as in the exhauster-house, so as to indicate the existing pressure, which should not exceed a column of one inch of water. At one period it was by no means unusual to have a pressure of 20 or 30 inches on the retorts, when, if these were highly heated, the incrustation of carbon was generated with remarkable rapidity and iron retorts were often burnt out with three months working. This, however, was the consequence of ignorance of the causes of such evil effects, and the present knowledge on these matters was only acquired after many years of practice.

In works of very limited capacity, the expenses of first cost of an exhauster, and continued attention and fuel, become a very important item, and should, if possible, be avoided. This may be effected by having the gasholders, either in their first construction or by the application of counterbalance weights and chains, so light as not to give a greater pressure than 2 inches; this done, and the dip in the main not exceeding half an inch, the purifiers and other apparatus on the works being of ample size, the pressure on the retorts will not exceed 3 or 4 inches. This attained, and the excessive heat of the retorts being avoided, the deposit of carbon, under these circumstances, will not be very considerable. We assume, in this case, that the mains are of sufficient capacity, so that a pressure of 1½ inch at the works is capable of giving a good and proper supply to the town, and, under ordinary conditions, that pressure should not be exceeded.

By the table of the various descriptions of coal, page 795, vol. xxiii., we find a remarkable difference existing between them as regards the quantity and quality of gas obtainable; and although these statements in some instances may not be strictly reliable, on account of the imperfect knowledge of the action of different temperatures at the time some of those experiments were made, together with the defective instruments formerly used, the table may nevertheless be regarded as a practical guide to the manager in the choice of coal for producing gas; and, by the quantity of ash contained in the coke being indicated, a tolerably correct idea of the quality of this product is thereby conveyed.

Different kinds of coal, whether cannel or caking, under like conditions of heat, capacity of charge, and size of retort, deliver their gas with variable facility. Cannel, as a rule, is easier distilled than caking coal, the former giving off its gas in about one-sixth less time than the latter.

The variable nature of the different qualities of cannel prevents any arbitrary law being laid down as to the proper heat for its decomposition, beyond the positive injunction not to subject the gas during its production to any unnecessary excess of heat, which would deteriorate its illuminating power. Some descriptions of cannel are advantageously carbonized at a lower temperature than we have specified, and the lower the better, so long as the whole of the gas is abstracted, and the operation not too protracted; and as the coke from this, unlike that from caking coal, is not materially improved by remaining in the retort, no advantage is to be gained on this score.

Before carbonizing, cannel coal is broken into pieces, in order to facilitate the operation, and when thrown into the retorts it decrepitates, thereby further reducing the sizes of the various portions; and with this class of coal the first hour of the charge is always the most productive. The following indicates the hourly production from a ton of Wigan cannel during a 4-hour charge, and may be considered as about the ratio of yield of gas for most kinds of inferior cannel coal:—

First hour, gas produced	. . .	3320	feet.
Second " "	. . .	2940	"
Third " "	. . .	2660	"
Fourth " "	. . .	1640	"

The time required for any ordinary charge of coal, no matter of what description, is controlled by the heat of the retorts. A given quantity, say of Newcastle, when submitted to the action of a temperature somewhat above cherry red, and requiring six hours for carbonization, would be effectually distilled in five hours at dull orange, and in four hours when the heat is slightly above bright orange; and undoubtedly this rapid production at high heats is one of the causes of the system being favourably regarded by engineers.

By some engineers, small charges and of short duration are advocated. In a few works of magnitude, where small cylindrical retorts of 14 inches diameter are still retained, their charges must necessarily be small, and, of course, the labour is increased in proportion, without, in our opinion, any benefit being obtained.

Excessive charges in the retorts are conducive of low production of gas. At the closing of the door of the retort, the gas should issue with a vivid flame; when this is not the case, the retorts are either at too low a temperature, or the charge is too heavy.

The coke derived from the generality of Scotch cannel has the form of the coal prior to its carbonization; it is compact and flaky, some of it contains a large quantity of ash, the Boghead having no less than about 70 per cent., which renders it quite useless as fuel. Kirkness contains 33 per cent., whilst there are others having 10 or 12 per cent. of ash, which are suitable for heating the retorts; but of this a large quantity is required for that purpose, as compared with coke derived from caking coal. Some years ago, in many of the works in Scotland, where cannel was exclusively used for producing gas, the furnaces were heated by an inferior description called "canal coal," similar to ordinary caking coal. For this purpose, the furnaces required to be constructed somewhat dissimilar to those in which coke was employed, as, when heating by coal, the flame is a most important agent, and a proper supply of air is necessary, in order to prevent the volatile carbon passing off as smoke; whereas with coke the heat is conveyed to the retorts entirely by the air becoming highly heated in its passage through the fuel.

In the carbonization of caking coal, often the second hour is the most productive, arising from the quantity of humidity held mechanically in combination therewith, which, being converted into steam, carries off a large portion of the heat, and thus the hydrocarbons are converted into tar. About the middle of the charge the coal becomes a doughy black, almost plastic, mass, and is greatly increased in bulk; and during the last half hour, as the gas is expelled, it attains a higher degree of heat, becoming more or less brittle and hard, according to

the duration of the operation or the temperature it is submitted to. When this is high, the coke has a white appearance, and is hard, but is always spongy or porous, occasioned by the passage of the gas therethrough. There are a few cannels—amongst them the Wigan and Ramsay's—which give a coke identical in appearance to the caking coal, although somewhat smaller, but well suited for heating retorts, and a good commercial article.

Of the various kinds of caking coal, the most stubborn in yielding its gas is that which is composed nearly all of slack, like some of the Newcastle coals; but these possess the advantage of yielding a superior coke, more particularly on account of their comparative freedom from iron; consequently less slag is produced, and less labour is necessary in clearing and clinkering the furnaces. The presence of iron in the coke likewise detracts very much from its appearance for sale.

At the first establishment of gas lighting, it was an accepted axiom that, whenever the price of coal was high, it would be compensated by a corresponding value being obtained for the residual coke. This, however, as experience proves, does not always hold good, as the value of that article is influenced by innumerable circumstances; nevertheless, in all cases, except in very small works, wherever caking coal alone, or with a small admixture of cannel, is used for producing gas, the revenue from the sale of the residual coke, after heating the retorts, should always contribute largely towards the cost of the coal carbonized.

It would be supposed that in works of the first magnitude, in consequence of the extent of their operations and the concentration of the heat, that the carbonization, as regards the fuel required, would be effected more economically than in smaller works—say those producing a hundred million feet per annum and upwards. This, however, is not the case, for the operations of medium-sized works, in this respect, are frequently more favourable and profitable than those of larger capacity, this being entirely dependent on the kind of settings and the amount of careful supervision in the retort-house. (*To be continued.*)

Communicated Article.

THE PARISIAN CEMETERY OF MÉRY-SUR-OISE.

(FROM OUR PARIS CORRESPONDENT.)

One of the most important sanitary questions affecting the city of Paris has been resolved by the Municipal Council at its sitting of the 14th of August. The following resolutions were adopted:—

ART. 1. There should be established on the plateau of Méry-sur-Oise a Parisian cemetery, having an area of about 800 hectares (say 2000 acres), which is to be connected with Paris by means of a special railway.

ART. 2. The Prefect of the Seine is authorized to issue a decree declaring the public utility in forming the cemetery, and to follow up the purchase of parcels of ground still unacquired for the completion of the exterior boundary of the said cemetery, either by treating with the proprietors, or by compulsory purchase, as provided by the law of May 3, 1841.

ART. 3. The prefect is requested to prepare, with the least possible delay, all necessary plans, &c., as will enable the council to decide on the following matters, namely:—

a. The railway above mentioned, and the collateral questions.
b. The establishment of several mortuary stations, intended to place the different parts of Paris in connexion with the railway to Méry.
c. The immediate appropriation of a portion of the area for interments at Méry.
d. Conditions and means of transport of funeral *cortéges*, and of persons having recourse to the cemetery.
e. The regulation of interments therein on the principle of the suppression of the common trench or grave.

ART. 4. The Prefect of the Seine is requested to take the necessary measures to open a competition, lasting six months, for the purpose of finding out the best possible method of cremation, or of any other system conducing to an analogous result.

The Municipal Council shall determine the conditions and programme of the said competition, and the Legislature shall be asked to pass a law allowing the permissive use of cremation for the city of Paris.

The discussion at the council was both long and excited; religious and social questions were raised, and it was attempted to show that by the creation of the new cemetery respect and veneration for the dead would suffer. We shall not enter into the details of this debate, but, only dealing with hygienic questions, shall examine the reasons which have led the municipal authorities of Paris to have proposed, since 1864, the closing of the cemeteries in the capital, and the creation of a grand necropolis at Méry-sur-Oise, of which the following affords a succinct description.

It is to the remarkable intelligence of the former Prefect of the Seine, M. le Baron Haussmann, aided by those able engineers MM. Belgrand and Alphand, that we owe the idea of the vast cemetery which will complete the remarkable work in process at Paris to improve its sanitary condition, and remove all causes of infection and epidemic disease. The reports of M. Belgrand before the Council of Paris, of which we shall give some extracts, demonstrate the great importance of choosing for the site of the new cemetery land whose subsoil water shall not pass into the Seine, which now affords the water supply of the Parisians, for the action of cemeteries on the soil and on the subsoil water cannot be passed over; it explains the violent opposition of all communities against any arrangement which might charge the water with the remains of decayed human bodies.

Until the close of the last century no measure was taken at Paris in the interest of the general health. The fœcal matters were received in permeable cesspools, and the places for refuse were disposed at the gates of the city, near the ramparts. The graveyards surrounded the churches; the sewers were simple ditches, open to the sky, and their water filtered away through porous soil. The gutters of the streets were in the middle of the causeway; each carriage that passed had one wheel in the gutter. The paving was always in a bad state, and a thick bed of house-refuse covered the road; and in the holes this fell into the subsoil, and extended right and left under the houses. The black refuse was a very powerful manure, much sought after by agriculturists, being strongly impregnated with organic matter. The houses of the Parisians thus stood on a thick mixture of rubbish and Paris refuse. The cellars beneath were really nitre-beds, used by the Administration of War, who leased the soil, and drew thence a large quantity of nitrate of lime, which was subsequently converted into saltpetre (nitrate of potash), used to manufacture gunpowder.

From the commencement of this century the administration of Paris has been diligently occupied in regard to the state of general infection of the subsoil of the city, and the most energetic measures were taken to combat with the evil. A law of September 24, 1819, obliged all the house proprietors to make their cesspools non-permeable; and the Prefecture of Police organized a system of surveillance which exists up to the present day. Permeable cesspools have become so rare that they are certainly without action on the subterranean water. Since 1830 the old causeways were replaced by convex roads, the gutters were washed twice daily by water from the Ourcq Canal, the paving was well relaid; and the house-refuse, taken away every morning, ceased to infect the subsoil. The construction of the sewers caused the disappearance of the greater portion of the draining-wells, and, above all, of the hidden wells. At last the Seine itself was preserved, as it passes through the City of Paris, by the construction of adjacent collecting-sewers.

In this brief summary of the sanitary measures taken during the first half of the present century, it is especially necessary to mention those connected with cemeteries. Those surrounding churches were successively closed between 1780 and 1804, and replaced by three great cemeteries situated outside of the city, as required by law.

The cemetery of Père Lachaise, and that of Montmartre, created the 21st Ventose, an IX., were erected in 1804 as municipal cemeteries. It was not until 1824 that the cemetery of Mont-Parnasse was opened. Their respective areas are as follows:—

Père Lachaise	44·00 hectares.
Montmartre	19·50
Mont-Parnasse	18·00
Total area of the three	81·50 (say, 200 acres English.)

The administration at first thought that the result of all these measures would have had a prompt action on the sanitary state of Paris, but the evil was so great that the purification of the soil and subsoil waters was effected with extreme slowness, and at present, after so many efforts and sacrifices, the sanitary danger is still considerable. On opening the beds of the sewers, traces are yet found of the former state of the soil in the neighbourhood of churches; the beds of the cemeteries are characterized by a thick layer of black earth, mixed with fragments of bones, and in almost every street a mixture of black rubbish and the refuse of Paris is found.

From these facts we are obliged to conclude that the subsoil waters of Paris must be greatly contaminated. In fact, the analyses of one of our most eminent chemists, M. Boussingault, show the following quantities of nitrogen salts in the wells of old Paris:—

Ammonia per Cubic Mètre of Water.

Wells at Clignancourt (Montmartre) . .	0·31 grammes.
Wells at Hôtel de Ville	34·35 „
Wells at Rue du Port Royal	1·32 „
Deep wells, Rue de Reuilly	0·02 „

The wells of Paris, therefore, contain a very notable quantity of ammonia, especially in those streets in the neighbourhood of the Hôtel de Ville. But their waters are highly rich in nitrates. The results of analyses made on 27 wells gave an *equivalent in nitrate of potass per cubic mètre of water* varying from 0·217 kilogrammes to 2·165 kilogrammes, with a mean of 0·737 kilogrammes. The nitric acid was estimated as nitrate of potass, but it is most likely that the greater portion of the nitrogenous products was really nitrate of lime. The weight of nitric acid corresponding to the previously mentioned mean of 0·737 of nitrate of potass is 0·398 kilogrammes, and the corresponding weight of nitrogen would be 0·103 kilogrammes.

Thus, despite the measures taken by the administration to preserve the soil of Paris from danger produced by organic matter, the well-waters yet contain a considerable weight of deliquescent nitrates, which are got from the cellars, which maintain them in a most unhealthy humidity. In the streets which surround the Hôtel de Ville such is the result of old cesspools not rendered water-tight, and still in action. On plunging the hand into the water of the wells of this quarter, and allowing it to dry, M. Boussingault recognized an odour evidently of fœcal matter. The gravity of these results becomes evident on considering the quantities of matters contained in the waters of the sewers. According to the analysis made in 1869, a cubic mètre of water from the sewer of Asnières contained—

Matters in solution	1·158 kilogrammes.
Matters in suspension	1·169 „
	2·327 „

Weight of nitrogen, 0·043 kilogrammes.

The mean weight of nitrates in solution in a cubic mètre of water in the wells of Paris was 0·737 kilogrammes.

If be added the weight of other dissolved mineral matters, and notably sulphate of lime, the unexpected conclusion is arrived at, that the water of the wells of Paris contains more injurious matters than the sewer of Asnières, for the well waters contain 0·103 kilogrammes of nitrogen per cubic mètre, while the water of the sewer of Asnières contains but 0·043 kilogrammes.

It is difficult, in the complex state of the soil of Paris, to ascertain the action of the cemeteries on the subterranean waters, but the following are some of the conclusions that have been arrived at. Two analyses of the waters of the cemeteries have given the equivalent of saltpetre (nitrate of potass) per cubic mètre of water at—

Montmartre Cemetery . . . . . 1·526 kilogrammes.
Mont-Parnasse Cemetery. . . . . 1·870 „

equivalent to 1 kilogramme of nitric acid.

In the water which falls drop by drop in the catacombs, draining into the wells on the left bank of the river, 1 kilogramme of nitric acid has been discovered per cubic mètre of water. The cemetery of Mont-Parnasse has, therefore, become an immense nitre-bed, and this has always happened where cemeteries insufficient in their area have been established on calcareous earth, permeable in its character.

The cemetery of Père Lachaise is in a still more unhealthy state. It is established on the greensand of Montmartre, an earth absolutely impermeable, and consequently the bodies are interred in water. It was proved that the soil was strongly impregnated with organic matters when the corporation took possession of it. The new burials increased this horrible state of things, and after a certain number of renewals of the trenches the soil arrived at a permanent state of absolute impurity.

In many parts of Paris veritable sulphur waters have been discovered in sufficient quantity as to lead to the proposed establishment of a hospital for their utilization. These sulphur sources have been equally indicated at Montmartre, in the neighbourhood of the cemetery.

The municipal administration was, therefore, decidedly wrong in placing these three cemeteries so near to Paris; and more, although they were intended for a population of less than one million of inhabitants, their area was evidently much too small. The common trench, renewed every five years, has not time to destroy the bodies, the soil quickly arrives at a permanently infected state, and passes, when the cemetery is closed, into the state of mould exactly like that of a garden bed. It is found, in fact, that the water of the wells of market-gardens around Paris, where the soil has become mould, contains 1·268 to 1·546 kilogrammes of nitrate of potass per cubic mètre of water—exacty like the water of the wells that exist near the cemetery of Mont-Parnasse.

In studying the character of the subterranean water of Paris, it is seen that the waters of Père Lachaise fall into the Seine towards the bridges of Bercy and Austerlitz; the waters of the Montmartre Cemetery divide themselves in two towards the Seine, at the Place de la Concorde, and at Clichy; and the waters of Mont-Parnasse arrive at the bridge of Saints-Pères.

These waters are added, in passing under Paris, to those corrupted by privies not made sound during the last century, to the sulphur waters which pass out of the old dust-heaps, and feed, during their passage, the 30,000 wells of Paris. 20,000 of these had been cleaned during the siege, to serve domestic purposes, in the event of other sources failing. Fortunately, the supply was maintained by the Seine, and artesian wells; had it been otherwise, the great mortality which then took place in the city would have been attributed to these abominable waters during the four months the siege lasted.

After having infected the wells, these waters enter the Seine, and hence tend to its further corruption. The analysis of the river at the bridge of Austerlitz gave per cubic mètre of water—

Of ammonia, in April . . . . . 0·12 gramme.
„ in October. . . . . 0·09 „

Even since the introduction of the water of the Vanne into Paris, the Seine still furnishes a large portion of the supply, not only for public, but also for domestic uses. It is, therefore, very important not to increase the impurity of the river, which at present is not very great.

It, therefore, appears that the removal of existing cemeteries had become necessary, not only because they are filled, and of no further use, but also because they have arrived at a state of permanent infection, and exercise on the subterranean water, and, consequently, on the public health, a most pernicious action, which will, unfortunately, long continue; but it must be diminished as much as possible by suppressing the cause of the evil. It is absolutely necessary to remove these dens of infection from the heart of Paris.

By way of summary, we remark that, for a cemetery in the neighbourhood of Paris to be acceptable, it is necessary that the soil should fulfil the following conditions:—

1. It is indispensable, above all things, that it should be sufficiently permeable not to allow any water to remain at the bottom of the graves. If this condition be not completely fulfilled—if, for example, during very wet winters, the water should remain at a depth less than two mètres below the soil—it would be necessary to lower its level, and to direct the waters by deep drains into watercourses where they would do no injury to humanity.

2. The soil of the cemetery ought to be sufficiently elevated above the level of the watercourses, so that at all times the graves should never be invaded by water.

3. It is not less necessary that rain water, absorbed by the earth of the cemetery, and which, therefore, would pass through the graves, should not flow into the Seine, nor into the canals and aqueducts which bring drinking water into the city, nor into wells or other sources whence the inhabitants in part draw their supply for house purposes.

All these conditions are fulfilled by the choice of the earth of Méry-sur-Oise, made by the engineers of the city for the Grand Parisian Cemetery, whose arrangement we shall describe in another article.

Correspondence.

GAS PURIFICATION.

Sir,—It has been a source of pleasure to me and to others, at this distance, to peruse in the pages of the Journal of Gas Lighting the proceedings of the last annual meeting of the association. The president's address displays all that ripe vigour and ability which characterize its author, and every paper read bears the stamp of conscientious thought, both as to diction and subject matter. I cannot resist the impulse to write and express my thanks to those who took such pains to render the whole proceedings so full of interest and value.

By the way, amid the multiplicity of healths that were toasted at the banquet at the City Terminus Hotel, it would be pleasant to some of us to know that "absent friends" were not forgotten. *We*, at least, thought of those at home, and their meetings, with many an anxious longing.

We ne'er forget,
Though there we are forgot.

The paper of Mr. George Anderson, on "Purification of Gas," is a valuable exposition of the subject from one point of view; but it is impossible to help thinking, on looking at the somewhat meagre discussion that followed the reading of it, notwithstanding Mr. Anderson's previous intimation, that the well-known ability of the author, and the weight and *momentum*, so to speak, of his style, carried all obstacles before them, and cowed some of those who, in their inmost heart, differed from much that was advanced. Either that, or there was an aversion on the part of many of the members present to disturb the harmony of an agreeable gathering. This latter I take to be the most probable, for even the president himself expressed his acquiescence in almost entirely all that Mr. Anderson stated, though the latter may be said to be the great advocate of lime, and the former of oxide of iron (as opposed to lime) purification.

The washer is a fondling of Mr. Anderson's. He has clung to it through evil and through good report, and his advocacy of its merits has gone far to raise it out of the disfavour into which it had fallen in the estimation of the majority of gas managers. Doubtless he is fully justified in his preference for this apparatus by the good results he has obtained from its working.

For a period of 17 years I have employed the washer, charged with both ammoniacal liquor and pure water, and, valuable though I have found it as an adjunct to the other apparatus, my experience of it leads me to say that it will not entirely remove the ammonia impurity from gas. I take it that this is also Mr. Anderson's experience, and hence he makes use of the scrubber for that purpose. It would have been satisfactory had he made a distinct statement on this point.

In the manufacture of gas of high quality also—say, 18 to 20 candles—unless the utmost care is exercised in regulating the temperature of the contained liquid, the action of the washer—particularly during the coldest months of the year—is most detrimental to the illuminating power. That was my Lancashire experience, and I have no doubt it is the experience of others besides myself. It is well known that the higher the quality of the gas, the more susceptible are its hydrocarbons to the influence of cold. In the more southerly parts of the country, where the average temperature of the year is higher, and where gas of a much lower illuminating power is made, this objection to the use of the washer is less felt. In Brazil, with our average temperature close upon 80° Fahr., the objection does not apply, although our illuminating power is 20 candles. Indeed, I find the washer to be indispensable here for efficient purification.

I observe that Mr. Anderson is careful to intercalate a saving clause into his paper, dealing with the *form* of the washer. Apparently, he would claim the scrubber as simply a washer under a wrong name. Probably this view is substantially correct; but the difference in the names is very useful, nevertheless, as indicating what form of washing apparatus is meant. His remark, where he questions the correctness of the term "scrub," in its application to this particular process, and implies a different mode of scrubbing on the part of the charwoman, would not hold good all the world over. The Brazilian heroine of that type scrubs the linen against a stone or flat board, just as we scrub the gas in a scrubber. So much for comparisons.

I am far from believing with Mr. Watson that the days of scrubbing with water are past, unless, indeed, Mr. R. H. Patterson's process should prove successful, and in that case the days of purifiers (as we at present understand the term) are also numbered. A well-constructed and properly managed scrubber is the best, if not the only, apparatus yet introduced for effectually and satisfactorily removing the ammonia from coal gas, and securing its utilization as a residual product.

The reason of the arrangement of the lime in separate layers in the purifiers is not far to seek, though some managers, probably blessed with ample area, profess not to be able to see it. Even when the purifiers are of the largest description, and when one thick layer of lime would be unobjectionable on the score of pressure, it is more advantageous to range the lime in separate layers. If in one layer only, the gas is liable to pass through the mass in distinct channels, less effective purification being the result; whereas, when the material, whether lime or oxide of iron, is in several layers, the atoms or particles of the gas, after passing through one and arriving at the vacant space, alter their relative position, and ascend through the next layer in different order, thus ensuring their more certain contact with the purifying substance.

There is no stronger advocate of ample purifying area than myself. The purifiers have always been, and are yet, to a great extent, the weak point in the apparatus of a gas-work; but we should be careful not to run from one extreme to another. Abundant purifying area is most desirable, and, if efficiency and economy in purification are to be achieved, indispensable. But we must draw the line somewhere.

Mr. Hyslop is inclined to think there should be six superficial feet of area for every 1000 cubic feet of gas per day. This, in answer to the president's query, he explained as being inclusive of all the three puri-

fiers in the set, so that he would allow two superficial feet for each purifier per 1000 cubic feet.

Let us apply this rule to the South Metropolitan Gas-Works—of which the president, Mr. Livesey, is the engineer—and see what it will work out to. The maximum daily production there is probably close upon 4,000,000 (four million) cubic feet. Then,

4000 × 2 = 8000, area, in superficial feet, of each purifier,
or (8000 × 3) 24,000 feet in all.

Of course, this area would have to be distributed over a series of sets, and it would consequently involve the erection of 20 *sets* of purifiers, each vessel being 20 feet square. Or if, say, 10 sets were preferred, then each purifier would have to be about 28½ feet square.

What about the interest on the capital required for such an outlay as this would necessitate both on land and apparatus? Surely economy in the spending of capital ought to be studied, as well as economy in working, otherwise we may pay too dear for our whistle.

Gas-Works, Pernambuco, Aug. 1, 1874. THOS. NEWBIGGING.

SANATORY.

SIR,—In my last I promised to state what effect has been produced in purifying the water we drink by abolishing the common cesspool system, and collecting the household "secondary products" in a properly constructed brick and cement underground tank, and applying the contents of the same to the orchard and garden; also to give some account of its effects on the fertility of the soil thus treated.

I abolished the polluted well, and dug another much deeper, hoping to catch purer water at a lower level, and puddled round the back of the brickwork higher up, to prevent the water in the polluted strata getting through; meantime, we used river water, which I had temporarily filtered, hoping to succeed with the well.

In this, however, I failed. After a month's use of the new well for all secondary purposes, it still had a disagreeable taste, and contained a large quantity of solid matter, although to the sight perfectly clear. This led me to provide a large filter and continue the river water for food purposes, leaving the well for secondary uses.

These events happened three years ago. During the first year I frequently tasted the well water, and found it bad. I have, however, recently tested it by permanganate of potash, and I find it purer than the river water, showing that the source of pollution having been so long stopped off, the water travelling through the strata has washed and oxidized the impurities, and I mention these circumstances that others may be guided against incurring an expense in which I failed; for, as the events show, I might, by waiting, have saved the expense of the new well.

Before referring to the effect of the sewage on the garden, I should first say a few words on the proper construction of the pit that is to contain the sewage. Whether these be of the water stanch kind which I built, or whether the drains of a house are led into one of the usual dry wall filter kind in common use, in any case I think they should be provided with an opening to let off gases, and not suffer these to travel back to the drain and enter the dwelling, which they are likely to do from a variety of causes, which it would take too much space to enumerate.

But I have never once seen a cesspool but what was closed over underground with no outlet save back into the house.

Now, when we have a heavy rainfall, the water must rise in those closed pits and discharge the air they contain; this will travel by the easiest route, and if it cannot get out through the earth on top of the pit, nor through the joints in the drain-pipes, it is certain to get into the house, more especially as servants very frequently lift the top of the bell-traps for the convenience of getting rid of tea-leaves, &c., faster than they will pass through with the trap in order.

I know a seaport town where the rising of the tide sometimes causes the gases in the sewers to burst through the water-seals of the sink-traps. The same will occur, and from the same cause, by the rise of the water-line in the ground where cesspits are; and I have frequently noticed smells about premises during rainy weather that did not exist at other times, which, I dare say, were due to the causes I have named.

To prevent any possibility of this, I left a "man-hole" in the crown of the dome, and in the thickness of the brick arch placed a perforated board, which I covered over several inches thick in dry slaked lime, and over all placed a lid; it is, therefore, impossible for the gases inside to exist at a pressure, and, as they will be decomposed in passing up through the lime, a nuisance cannot arise.

The Application of the Sewage.

Just after the removal of a crop, and, if convenient, before the ground has got sodden on the surface (and by preference immediately before rain), the ground is well soused with the sewage. I have pipes laid over the garden, with numerous taps for offlets, under any of which a tub is placed, and the sewage dipped from this, and thrown on from a pail. I have tried the hose system, but it is tedious, requires to be shifted about, and, unless a great amount of attention is given, the sewage is not spread so well; besides, the wear and tear is expensive, and as there is no way in which a man can get rid of so much water as by dipping a pail and throwing the water away, I adopt it in preference to any other.

I apply the sewage without any preparation whatever beyond its being diluted by the soapsuds from the laundry, and, as it is too strong, I intend to connect a rain-water pipe into the sewer-pit, for at present there is a little nuisance from smell just at the time the sewage is being thrown on; but in five minutes after the smell is gone, unless pools of sewage lie on the surface, which should never be the case.

I have often been surprised at the rapidly deodorizing properties of earth; not only can one not smell anything offensive passing through the garden, but even if you stoop down to the ground there is no smell, whereas the empty tub that contained the sewage will smell strongly.

My reason for using the sewage just before rain is that the rain washes it in, and cleans the surface; and in cases where we use it to the roots of growing crops, such as peas, beans, onions, strawberries, &c., the rain washes any off that may have touched the leaves; for I have always found that when the foliage gets wet it mostly suffers, and where it is difficult to water the ground without wetting the plant also, as in cucumbers, vegetable marrows, and the like, I also water with clean water from the rose of a watering-pot to finish.

As a rule, it is not necessary to use the sewage during the growth of the plant, but in dry weather, or if luxuriant crops are desired, it may be done.

I personally attended to the watering of some rows of scarlet runners last year. They grew about 12 feet high, and produced more than double the crop that ever grew without sewage.

There is no crop grown in the kitchen garden for which it will not answer as manure; it is excellent for asparagus beds, and latterly, I am making those sunk *below* the surface a few inches instead of raised *above* the ground, as is common round London. I can, therefore, flood the bed, and as we know the plant is originally from the sea-side, where it grows in swampy ground, I believe that I shall get better plants than by the old raised fashion.

The entire smell could be taken from the sewage by adding some carbolic acid; but in most cases this would not be required, and I have never done it unless by way of experiment.

In any change of this kind, such as from solid to liquid manure, you must manage to get your gardener with you. At first I had some difficulty in this respect. It would not do; he had seen it tried; there's nothing like the manure from the stable-barrow—and so on in this way; and, feeling the difficulty, I looked about to get him in the wrong, and then assert my superiority; so I took him up on the solid manure from the stable, and asked him whether he thought that the solids or the fluids passing off from an animal contained the most manure. Oh, the solids! "Now, then, gardener," I said, "there you are wrong;" and I produced Liebig's treatise on the "Chemistry of Agriculture and Physiology," which sets forth the contrary as the fact, and gave him the book to read.

I had no real bother after this, and, excepting to cover up the roots of plants from the frost or for making a hot-bed, no solid manure has been applied to my garden for over two years.

The application of sewage to land is not nearly so costly as that of solid manure. There is much less labour; the digging is done more easily, and the soil is getting into better condition every time it is dug—less lumpy and more friable.

Having said this much on the practice, I would now say a few words on the *rationale* of the thing.

The manure passing from man is better calculated for growing the food of man than that passing off from any other animal *that does not eat the same food as man.*

In agriculture, as in chemistry, we neither create nor annihilate one particle of matter. In these, as in all the other actions of man, we but alter the form of pre-existing material.

Now, different kinds of food have very different constituent parts. The constituents of beef are very different from the constituents of cabbages or potatoes, and as man is a beef as well as a vegetable-eating animal, the offal from a mere vegetable-eating animal is not so good for the production of his food as the same from a beef as well as a vegetable eater. Hence, man produces best, and what contains most of the constituents necessary for the production of his food.

On the other hand, unless we keep putting on the land as much as we take off it the land must get impoverished, because, in turning manure into crops, we but alter the state of pre-existing matter. Therefore, although all the crops were eaten on the land, if we throw away the greater and most valuable portion—the fluids—we must, and in no great time, rob some other source to make good the deficiency we have by our ignorance or wastefulness caused.

Acting as I do, however, the land becomes richer every year, for, in addition to what the crops themselves produce, I add all the beef, sugar, soap, soda, &c., which I buy, while the manure from the horses, cows, pigs, &c., goes to the land which produces their food, and which it is best calculated to produce.

If, in this hurried sketch, there are any points I have left obscure, I shall be happy to explain more fully on their being pointed out.

4, *Cannon Row, Westminster, Aug.* 27, 1874. GEORGE ANDERSON.

THE COST OF GAS IN SCOTLAND FIFTY YEARS AGO.

SIR,—The article in your paper of the 25th, headed "The Cost of Gas Fifty Years Ago," gives an erroneous impression on the subject, as the price refers to oil gas. Coal gas, entirely made from first-class cannel, was supplied by this company at 12s. per 1000, when meters came first into use here in 1821. It remained at that price until 1829, when the series of reductions dependent on increase of business began. I enclose a copy of the annual charges without meter at that period.

The condition as to the supply of burners was probably universal at that time, owing to the great number of contract lights without meter.

J. K. WATSON.

Edinburgh Gaslight Company's Office, 25, Waterloo Place, Edinburgh, Aug. 28, 1874.

P.S.—I may add that the Edinburgh Oil Gas Company, whose prospectus, dated 1824, you reproduce, proved an unsuccessful undertaking, and was bought up by this company in 1829.

INCORPORATED BY ACT OF PARLIAMENT, MAY 23, 1818.

Table of the Annual Charges of the Edinburgh Gaslight Company, for Burners of Various Descriptions and Sizes, to be used till the Hours specified.

Description of Burners.	For Six Days in the Week.								
	Evening Lights.					Morning Lights.			
	From Sunset & not to Burn longer than Eight o'clk.	From Sunset & not to Burn longer than Nine o'clk.	From Sunset & not to Burn longer than Ten o'clk.	From Sunset & not to Burn longer than Elev'n o'clk.	From Sunset & not to Burn longer than Twlv. o'clk.	From Four o'clk. till Day-light.	From Five o'clk. till Day-light.	From Six o'clk. till Day-light.	From Seven o'clk. till Day-light.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	s. d.
One Argand, No. 1 . .	1 0 0	1 10 0	2 2 0	2 14 0	3 6 0	1 2 0	0 15 0	7 6	4 0
Ditto, No. 2 . .	1 9 0	2 2 0	2 16 0	3 9 0	4 2 0	1 8 0	0 19 0	11 0	5 0
Ditto, No. 3 . .	2 0 0	3 0 0	4 4 0	5 4 0	6 4 0	2 2 0	1 7 0	15 0	7 6
One Cockspur, with 1 jet	0 10 6	0 15 0	1 1 0	1 7 0	1 13 6	0 9 6	0 6 0	3 0	2 0
Ditto, 2 jets	0 18 0	1 5 0	1 16 0	2 4 0	2 12 0	0 17 0	0 11 6	6 6	4 0
Ditto, 3 jets	1 4 0	1 15 0	2 8 0	3 0 0	3 12 0	1 3 6	0 15 6	9 0	4 0
One Bat's-wing. . . .	3 4 0	3 3 0	4 4 0	5 4 0	6 4 0	2 2 0	1 8 0	16 0	7 6

Lights for dwelling-houses to be charged till 11 o'clock.

One-sixth of the above charges to be added when the light is used on Sundays.

Lights for irregular periods to be agreed on and fixed at the company's office with the surveyor.

N.B.—It is most earnestly requested, that whenever a smell of gas is felt, immediate notice thereof may be given at the company's office, and that every precaution may be taken so as to prevent any one approaching with a light the situation where the gas is accumulating, especially if in a cellar or any other confined place.

Regulations to be observed, and Conditions on which Gas is supplied to the Consumers.

1. Lighting not to commence till the sun has set. Argand burners not to be used without cylindrical glasses. The flame to be regulated so as not to exceed 3 inches in height. The cockspur flame also not to exceed 3 inches.

N.B.—When the above is not attended to, smoke and smell are produced, and is otherwise injurious, without adding to the brilliancy of the light.

2. The charges to be paid half yearly in advance, one-third at Whit-Sunday, and two-thirds at Martinmas.

3. All contracts with the company to be held as for one year—viz., from Whit-Sunday to Whit-Sunday, and none can be supplied for a shorter period, unless by a special agreement made at the office. Persons commencing between the above periods, to be charged from the date their premises are lighted, and pay up in full till Whit-Sunday following. After the burners are delivered, a notice annexed to the conditions and regulations will be filled up, stating the same, and delivered to the consumer; any alteration required must be signified within two days after the date of the notice.

4. The service-pipes branching from the mains will be laid at the expense of the company, provided the length does not exceed 20 feet. If a greater length be necessary, a charge will be made for laying the same, according to a scale exhibited at the office; but the whole of the pipe must be held the company's property notwithstanding.

5. Before the gas is supplied, the inspecting officer of the company must be satisfied that the interior fittings are correctly made; one day's previous notice is required when fittings are to be examined. And, in case of getting into disrepair, so as to occasion an escape of gas, the supply will be discontinued until put into proper order.

6. No burners to be used but those furnished by the company, and to be paid for on delivery, and none sold after three o'clock p.m.

7. Burners are not to be changed at any other period of the year than at Whit-Sunday, and such must take place within ten days thereafter.

8. At or before the term of Whit-Sunday, the surveyor will take an account of the number of burners each consumer of gas will require for the year ensuing, and will deliver to him or her a copy of these conditions and regulations, and on the other side thereof, a notice specifying such number, with the hours to which he or she is entitled to burn, which notice will be held as the terms of the agreement, unless objections are made to it within ten days after it is delivered.

9. The officers of the company to have free access at all times to check the height of flame and examine the burners.

10. Should the apertures or holes of the burners be widened, from use or otherwise, the inspectors are authorized to take them away, and to turn off the gas until replaced by new ones, to be paid for by the consumer; but if any one is detected wilfully enlarging them, the company will discontinue to supply him or her with gas altogether, and the charge for the light which may have been paid in advance, will be forfeited to the company.

11. The lights must be extinguished within a quarter of an hour after the time contracted for, except on Saturdays, when they may be used till twelve o'clock.

12. Any deviation from the above regulations and conditions will oblige the company to discontinue the supply, and the charges which the consumer may have paid in advance become forfeited to the company.

Note.—Consumers already supplied, who are desirous of adopting the gas-meter at any time during the year, are required to give a fortnight's notice by letter to the company's manager; but should the consumer have previously paid the half-yearly or whole charge for the light, then the meters are only allowed to be adopted at the terms 11th of November or 15th of May, as the case may be. The charge for gas by the meter is 12s. per 1000 cubic feet.

May 15, 1827.

THE NEW GASHOLDER TANK AT REDHEUGH.

SIR,—In the interesting description of the tank in course of construction for the Newcastle Gas Company there is one important omission which engineers would be glad to have supplied. I refer to the character of the ground, it being obvious that a tank in solid clay would be of a different construction to one in loose gravel or running sand.

I think the time is not far distant when it will be proved that all brickwork, stone, hoop iron, and (better still) all puddle may be dispensed with in the construction of gasholder-tanks, of whatever size and in whatever ground.

GEORGE LIVESEY.

South Metropolitan Gaslight and Coke Company,
589, Old Kent Road, Aug. 29, 1874.

ST. PETERSBURG WATER-WORKS COMPANY.—The first ordinary general meeting of the City of St. Petersburg New Water-Works Company, Limited, was held on Friday last, at the Cannon Street Hotel, London—the chairman of the company (Mr. W. R. S. Fitzgerald) presiding. The directors report informed the shareholders that the whole of the shares had been allotted, and that before the subscription list was closed the demand for shares was considerably in excess of the number offered for issue. The land for the company's buildings in the Vassili Ostroff district had been given over to their representative, and there would be no difficulty in finishing their erections before the end of October, as required by the terms of the concession. The chairman, in moving the adoption of the report, said that so far as they had gone they had every reason to be satisfied with the progress of the works. They had no reason whatever to doubt that the expectations held out to the shareholders in the prospectus would be fully realized. It was upon these assurances that the public had subscribed their money to the promotion of the company. It would be gratifying to those present to know that, when the share list was presented to the committee of the Stock Exchange, they expressed the opinion that they never had a more satisfactory list furnished to them by any company quoted on the Stock Exchange. It was obvious, from their own experience and knowledge, that the shares were taken up by those who had confidence in the concern, and who regarded the holding of shares in the St. Petersburg Water-Works Company a satisfactory investment of their money. He had several letters from shareholders stating that the shares were quoted at a discount in the public journals, and asking why that was so. All he could say in reply to that was, that from the first day the company was originated until the present time, there never had been a single share transferred at a discount. A very few had been transferred at par, but, as a general rule, they had been transferred at a premium. The agent in St. Petersburg had sent the latest intelligence concerning the progress of the works, and from his report it appeared that they were in such a state of progress as to give assurance that they would be completed within the stipulated time. The engineer had furnished a like satisfactory account. The report was adopted, and the proceedings closed with a vote of thanks to the chairman.

Legal Intelligence.

LIVERPOOL BOROUGH SESSIONS.—FRIDAY, AUG. 28.
(Before Mr. J. B. ASPINALL, Q.C., *Recorder.)*

LIVERPOOL UNITED GAS COMPANY *v.* THE OVERSEERS, ETC., OF THE PARISH OF LIVERPOOL.

Mr. RUSSELL, Q.C., with Mr. GOLDNEY, appeared for the appellants, the gas company; and Mr. H. BREMNER for the respondents.

This was an appeal by the Liverpool Gas Company against the poor-rate of the parish of Liverpool for 1872, in which the gas company were rated for the whole of their works on the rateable value of £19,000. When the case originally came before the Recorder, the gas company sought to reduce the rate, producing evidence to show that the rateable value of their works was only £11,555. It was then agreed that the matter should be referred to Mr. Hunt, the well-known London surveyor, to ascertain the exact facts and figures, the latter of which were of a very complicated character. Mr. Hunt, in substance, found that the rateable value of the company's works was £19,415, this being slightly in excess of the parish valuation. The matter came again before the Recorder on Thursday, on the application of the parish to confirm the rate in accordance with Mr. Hunt's finding.

Mr. RUSSELL took exception to Mr. Hunt's decision, first on the ground that it was not clear what Mr. Hunt meant in assessing the present value of the meters at £60,000; secondly, that it was a matter of doubt whether the body of his certificate was in agreement with the schedule attached to it on the point respecting the renewal of retorts; and, thirdly, that an allowance should have been made by the arbitrator on account of the gas company being limited to making a profit of 10 per cent. He submitted that although the figures stated by Mr. Hunt bore out the parish valuation, yet, upon two grounds argued before Mr. Hunt, the gas company had succeeded in maintaining their view, the points being as to how the deductions to be allowed for the meters were to be calculated and on account of a claim put forward by the gas company of an allowance of 2½ per cent. for risks and casualties. On these two points Mr. Hunt appeared to have taken the gas company's view.

Mr. H. BREMNER, who appeared on behalf of the parish, pointed out that both in respect to the meters and to the renewal of retorts it was quite clear that the arbitrator had made no mistake. He failed to follow the argument of his learned friend as to the bearing of the limitation of the gas company for making a greater profit than 10 per cent., on the rateable value of the company's works, which, he maintained, was altogether apart from any such consideration. He asked the Recorder to confirm the rate, and submitted that as the parish had substantially succeeded in the appeal, they should be awarded the costs.

The RECORDER declined to state on the moment what course he should take, as to whether he should find it necessary to refer to Mr. Hunt or not. If he should come to that conclusion, he remarked that it would be necessary to let the appeal stand over until the next sessions.

The case was then adjourned until this day, when the Recorder confirmed the rate. In respect to costs, he decided that each party should pay their own, and that the costs of the arbitration should be divided between them.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

The following are the returns of the Society of Medical Officers of Health on the composition and quality of the metropolitan waters in August, 1874:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen.		Hardness.	
			As Nitrates, &c.	As Ammonia.	Before Boiling.	After Boiling.
Thames Water Companies.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	16·97	0·071	0·115	0·001	13·6	3·3
West Middlesex	16·53	0·042	0·131	0·000	13·4	3·3
Southwark and Vauxhall	16·91	0·086	0·114	0·002	13·6	3·3
Chelsea	16·93	0·074	0·130	0·001	13·6	3·3
Lambeth	17·00	0·078	0·147	0·001	14·0	3·5
Other Companies.						
Kent	28·00	0·004	0·280	0·000	20·8	5·6
New River	17·47	0·018	0·131	0·000	14·3	3·3
East London	16·00	0·036	0·125½	0·001	13·2	3·2

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

The water was found to be clear and nearly colourless in all cases but the following, when it was more or less turbid—namely, in those of the Grand Junction, the Southwark and Vauxhall, the Chelsea, and the Lambeth Companies. The average quantity of water supplied daily to the metropolis during the preceding month was, according to the returns of the water companies to the Society of Medical Officers of Health, 127,563,243 gallons; and the number of houses supplied was 512,203. This is at the rate of 37·5 gallons per head of the population daily.

HY. LETHEBY, M.B.

BARNET DISTRICT GAS AND WATER COMPANY.

The Ordinary Half-Yearly General Meeting of the Stock and Shareholders of this Company was held at the London Tavern, on Friday last—J. F. BONTEMS, Esq., in the chair.

The SECRETARY (Mr. W. C. Humphrys) having read the advertisement convening the meeting, the seal was affixed to the register, and the minutes of the last meeting read and approved.

The following report and statement of accounts were taken as read:—

The directors are sorry to have to report the death of their highly esteemed and much respected colleague, Mr. Richard Harris.

In submitting to the proprietors the report and balance-sheet for the half year ending the 30th day of June last, the directors have to report that the arrangement with the Patent Gas Company for the cancellation of the working agreement has been completed, and that the works were formally handed over on the 21st day of March last.

From that date your directors have been manufacturing and supplying gas to the consumers, but until new retorts were erected the gas was manufactured in those left by the Patent Gas Company, during which time, in consequence of the excessive consumption of coal and fuel, a considerable loss was sustained. Other extraordinary expenses were also incurred for additional labour, change of staff, &c.

The directors are, however, glad to report that the district is now being satisfactorily supplied with gas, and that such supply will be maintained.

The water supply is much improved. This has arisen, firstly, from the greater attention paid to the distribution; and, secondly, from the increased supply of water obtained from the old well, and it is believed, when the new 10-inch pumps are set to work, that the supply will be still further increased, the quantity of water in that neighbourhood being practically unlimited.

The new well at Finchley has been allowed to remain inoperative, as the directors have not, up to the present time, felt justified in adopting the recommendations which were made. Your directors will, however, at the earliest opportunity, take the question of the development of the well into their serious consideration.

Looking at the difficulties which have been surmounted, the improvements which have been effected, and the increase in the gas and water rental (about £360 for the past half year), your directors feel that, although they are unable to declare a dividend, the

position of the company is much improved, and, while deeply sympathizing with the proprietors, beg to assure them that the future prospects of the company are cheering.

Capital Account, June 30, 1874.

Dr.				*Cr.*			
Stock A	£54,220	0	0	Fixed plant, gas—			
„ B	12,280	0	0	Amount expended as per last account	£60,892	8	1
Share capital A—				Add since expended	330	12	2
1510 shares £15,100 0 0				Fixed plant, water—			
Less amts. not called up and calls unpaid 711 0 0				Amt. expended as per last account £36,306 8 7			
	14,389	0	0	Add since expended 296 17 11			
Mortgage bonds	16,500	0	0		£36,603 6 6		
				Less credits 567 6 6			
					36,036	0	0
				Balance	129	19	9
	£97,389	0	0		£97,389	0	0

General Balance-Sheet, June 30, 1874.

Dr.				*Cr.*			
Capital account, balance brought down	£129	19	9	Cash in hand and at bank	1,147	2	7
Loans	3,250	0	0	Stocks	1,761	16	9
Amounts due to sundry persons	2,812	6	8	Rental and arrears	2,490	3	1
Profit and loss account, net revenue balance	61	1	5	Amounts due from sundry persons	854	5	5
	£6,253	7	10		£6,253	7	10

Gas—Revenue Account for the Half Year ending June 30, 1874.

Dr.				*Cr.*			
Manufacture of gas—				Sale of gas—			
Gas bought, Patent Gas Co.	£488	0	3	Private rental	£2,632	8	10
Coals	959	10	6	Public lighting	196	8	6
Purifying	32	16	11	Rental of meters	138	19	1
Wages	180	2	10	Residual products—			
Repair & maintenance, works and plant	51	5	4	Coke	160	10	2
Salaries of engineer, &c.	79	6	8	Breeze	9	3	0
Distribution of gas—				Tar	48	11	8
Salaries, inspector and clerks	19	1	0	Rent account	30	0	0
Repair & maintenance, mains and services	55	0	4	Miscellaneous receipts	3	0	0
Repairing & renewing meters	17	12	6				
Public lamps—							
Lighting and repairing	46	11	2				
Rent, rates, and taxes—							
Rent	13	9	2				
Rates and taxes	90	11	10				
Management—							
Directors allowances	75	0	0				
Salaries, secretary and accountant	103	4	8				
Collectors commission	52	15	2				
Stationery and printing	47	6	10				
General establishment charges	85	4	2				
Auditor's fees	1	15	0				
Bad debts and allowances	84	13	1				
Law charges	99	11	11				
	£2,583	4	4				
Balance to profit and loss account, net revenue	635	16	11				
	£3,219	1	3		£3,219	1	3

Water—Revenue Account for the Half Year ending June 30, 1874.

Dr.				*Cr.*			
Coals	£524	6	4	Sale of water	£1,272	2	5
Wages	106	5	10	Rents	8	12	3
Repair & maintenance, works and plant	161	1	8				
Salaries, inspector and clerks	9	10	8				
Repair and maintenance mains and services	39	19	8				
Salaries of engineers, &c.	29	3	4				
Rates and taxes	77	4	6				
Directors allowances	37	10	0				
Salaries, secretary, accountant, &c.	41	13	4				
Collectors commission	26	7	8				
Stationery and printing	23	13	4				
General establishment charges	40	16	1				
Auditor's fees	0	17	6				
Bad debts and allowances	67	15	9				
Law charges	22	12	6				
	£1,208	18	2				
Balance to profit and loss account, net revenue	71	16	6				
	£1,280	14	8		£1,280	14	8

Profit and Loss Account, Net Revenue, June 30, 1874.

Dr.				*Cr.*			
Shareholders for half year's dividend to Dec. 31, 1873	£1,060	10	0	Jan. 1. Balance brought from last account	£1,080	4	8
Interest on loans and mortgage bonds to June 30, 1874	666	6	8	June 30. Revenue account, gas	635	16	11
Balance available for dividend for the half year ending June 30, 1874	61	1	5	Revenue account, water	71	16	6
	£1,787	18	1		£1,787	18	1

The CHAIRMAN observed that the first paragraph in the report called the attention of the shareholders to the death of Mr. Richard Harris, and he thought it would be the duty of the meeting to take notice of that event before proceeding to the ordinary business of the day. As one who had known Mr. Harris over 20 years in connexion with this and other companies, and who had been on terms of intimate friendship with him during the whole time, the meeting would perhaps receive from him the following proposition, and place it on the minutes:—"That this meeting records, with deep regret, the death of Mr. Richard Harris, one of the directors of the company, whose earnest service and friendly behaviour won for him the respect and esteem of all his co-workers."

The motion was put and carried, and it was also resolved that a copy of the same should be forwarded to the family of Mr. Harris.

The CHAIRMAN said two of the directors, Mr. Glaisher and Mr. Wilkinson were at present in Belfast, and much regretted their inability to attend this meeting; Mr. Balfour also was absent, from severe illness. He next wished to say a word about a statement lately made at the Mansion House Police Court, with regard to public companies, by Sir George Bowyer. He thought it behoved the chairman of every such company to notice that statement on the very earliest opportunity, and to contradict it. It was stated by Sir George that it was customary for the directors of public companies to receive free gifts of shares to qualify them to become directors. It was due to the shareholders of all companies that the chairman and directors should state unequivocally what had been the practice in this respect, so far as they were concerned. As the chairman of the Barnet District Gas and Water Company, he wished most distinctly to state that neither in this nor in any other of the companies to which he belonged, had he ever received a single share beside those which he paid for as every other shareholder had done, and that, as far as he was aware, the same might be said of every other director with whom he was associated. Turning now to the report which the meeting were asked to adopt, he felt no doubt that the shareholders were disappointed with it, and he could unhesitatingly say that they were not more disappointed than the directors themselves. The board certainly thought that the previous half year would be the worst half year in their history, but that had turned out not to be the case; the fact was they seemed to have had during the last half year the accumulated result of all their previous difficulties. First of all they had the result of the neglect and the waste which had been brought about by some of their *employés*, which they had previously noticed, and which led to the changes referred to at the last meeting. They had had the expense of the restoration of the works after the termination of the arrangement with the Patent Gas Company. The shareholders knew the difficulties which the board experienced with regard to that company, and, no doubt, they fully expected that, when the works came to be restored, considerable expense would have to be incurred. That expense was increased by the work of restoration having to be undertaken six months sooner than was anticipated. It was true that, under the agreement, the Patent Gas Company had to pay a certain sum on account of that restoration—a sum which the directors thought, when the agreement was made, would cover the whole expenditure. There had, however, been expenses beyond that sum, and this had increased the difficulties of the last half year. Then the directors had to take to the works themselves, and that, too, at a time when they were paying a large contract price for coals. If the shareholders had made any calculations from the figures attached to the report, they would have seen that the average cost of coal at the gas-works during the half year was 26*s.* per ton, and at the water-works 27*s.* 2*d.*, that amount being, of course, increased by the expense of carriage. The company had a shoot at the gas-works, but not at the water-works; and, besides that, some of the coal had to be carted to Finchley. He was happy to say that the present contract for coal was 21*s.* 3*d.*, instead of 26*s.*, so that they might hope for better things in the future so far as coals were concerned. During the last half year also the directors found that certain bad debts and allowances had to be made in consequence of the difficulties connected with the supply of gas and water, and the discontent which had been in existence in the district. Such things always caused an unwillingness to pay, and the necessity for certain bad debts and allowances, which would never be made if the supply were going on satisfactorily as in ordinary times. Then, as they were told by Mr. Finlay at the last meeting, there was a large outlay of unproductive capital, from which the company were still suffering, in consequence of the Finchley works not being available. All these things had accumulated in the last half year, and caused a much worse return than was expected. But he thought he might safely say that those difficulties were quite at an end, and that the shareholders would now reap the advantages of a returning prosperity. The company possessed an almost unexceptionably good staff, and they might, therefore, expect to have their expenses much reduced. Mr. Lass, the accountant, had written a very hopeful report, but he (the chairman) believed it was not more hopeful than it should be from the expectations the directors had as to the future. There were all the savings to which he had referred, and there was the increase of rental, mentioned in the report, which was very satisfactory. The directors were constantly receiving applications for laying on water to new houses, which must increase the rental still further. The new railway, from Finsbury Park to Broad Street, which would save passengers from having to travel by the Underground line, would tend to increase the number of inhabitants in the company's district. One means of saving, which he looked to, was in the interest on bonds. The company were now paying 6 per cent. upon many bonds, which would be renewable before long, and he thought, from the prospects of the Money Market, that some of the shareholders would like to take up those bonds at 5 per cent. With regard to the works at Finchley, he might remind the meeting that the report stated the directors had turned their thoughts more to the old works lately. They were advised that they could get more water from the old works and at a cheaper rate than raising it at Finchley, and as the inhabitants of the district were clamorous for a larger supply, and as the shareholders were not willing to supply the directors with more capital until they got more dividend, the board thought it better to take the advice offered them and get their supply from the old well with as little expense as possible. They had tried and had been successful. They were now getting 20,000 gallons more water a day, and they hoped to get still more when they had stronger pumps in operation. They had not at all given up the idea of getting water at Finchley, the district would require it, and they had reason to believe that with proper appliances water might be obtained there when they had the money to do it, and the necessity for the added supply arose. He might try to console the shareholders by speaking of the effect of the times upon other companies; he might tell them how some country companies were without dividends, and how some of the London companies would be in the same position were they not protected by exceptional legislation. But those things were not much consolation to himself, and he ventured to think would not very much console the meeting. What they wanted was that their own concern should pay, and towards securing that object he could assure them the directors had done all they could. Since the amalgamation he saw that they were not properly served by their *employés* at Barnet, and he was not satisfied until they had an entire change. That change had been accomplished, and he was more than satisfied, and more hopeful as to a speedy success than before. The badness of the dividend hitherto was not the fault of the directors; they had done their best to avoid it, and they would continue to exert themselves to the utmost to secure more satisfactory results in the future.

Mr. STOKOE, the late engineer and manager of the company, expressed his entire dissatisfaction with the report. The Finchley works, he said, had been standing still for the last 13 months, and the whole of the shareholders money there had been expended without the slightest benefit. He complained also of the state of the works at New Barnet, and warned the directors that unless something was speedily done the New River Company would come in and take the supply out of their hands.

Mr. FLITCROFT declared that, in his opinion, a more abominable balance-sheet had never been prepared. In a concern with which he was connected, at Bolton, which turned over more than £21,000 in the half year, the cost of management was less than in the Barnet Company, with its revenue of one-fourth of the amount. He thought the best plan would be to pass a resolution allowing the directors and officers to divide the whole thing among themselves, for they seemed to be working it entirely into their own hands. What did they want with meetings at the London Tavern, or offices in the City? He could find men who would undertake the management a great deal better than the present directors for £100 a year.

The CHAIRMAN said the directors had only had £25 each for 12 months work.

Mr. FLITCROFT said they had taken altogether £214 in the year for mismanaging the concern.

Mr. FINLAY said he altogether disagreed from the directors, who spoke in the report of the prospects of the company being cheering. He did not believe anything of the kind. He wished to be informed under whose advice the directors had made the outlay at Finchley, and what the total amount expended was for sinking the well, for machinery, boilers, pumps, &c. He wished further to know whether the whole of those works had not now been abandoned, and whether the entire outlay was not unproductive. The chairman told them that they had gone back to the old well, and found the supply from it

was sufficient for the whole district. Why did they not discover that in the first instance? As to the remarks about other companies, he could inform the chairman that many companies, not much larger than this, had pulled through the coal crisis and paid full dividends. He did not expect it in this company—in fact, it was quite impossible so long as their capital remained ten times the amount of their rental. If things had been properly looked into by the old directors, the large unproductive expenditure would never have taken place. He wished the chairman to inform the meeting how many houses there were in the district out of charge, and whether they had not found that the water had been running to waste for years through 3 and 4 inch pipes without the board or any of the officials knowing anything about it.

Mr. LIVESEY said, in looking over the balance-sheet, it struck him as most extraordinary—in fact, he had never before seen anything like it. The capital of the company was ten times the amount of the rental—£97,000 for a rental of £9000. He did not think there was another company in existence which could boast of such a state of things. Turning to the gas account, when he came to look at the cost of coals in relation to the products, another extraordinary discrepancy appeared. Instead of blaming the Patent Gas Company for having injured them, he thought the shareholders were much indebted to them, for if it had not been for them the accounts would probably have shown a much worse condition of affairs. From coals, which, during the last half year, cost £959, the directors realized in the shape of sales of residual products, £218—less than 25 per cent.! Now, it was a very poor return if a company could not get 50 per cent. of the cost of coals in residuals sold. Many companies got more than that. Then, as to bad debts, the chairman had offered an explanation, with which, of course, the meeting must rest satisfied; but he (Mr. Livesey) could not help pointing out that they amounted to something like 3 per cent. of the rental, whereas it was ordinarily considered that 1 per cent. was quite as much as they should be. As to law expenses—£99—it certainly seemed a heavy charge for one half year. He drew attention to these figures, not for the sake of making a fuss about the balance-sheet, but in order to urge upon the directors the necessity of making some efforts to lessen these items in the future, as well as to increase the income. In his speech the chairman said something about the Patent Gas Company having left the works in such a state as to render a large outlay upon retorts necessary; but he (Mr. Livesey) could not find in the revenue account any item of expenditure on that head. There was an item of £51 for repair and maintenance of works and plant; but every one knew that £51 would go but a little way in setting retorts. He was afraid that the outlay on these retorts had been charged to capital, as he found an item in the capital account of £330 for expenditure during the last half year. If this £330 was not for restoration of retorts, the proprietors had a right to ask out of what fund the restoration had been made. Undoubtedly, the cost should be carried to account of revenue. All he could say, from an examination of the affairs of the company, was that the past working showed the management to be most inefficient; and if the present directors were in any way responsible for it, the best thing they could do would be to retire in a body, and allow the shareholders to elect others in their places. He did not quite like the chairman's reference to the *employés*—it came with a very bad grace from the representative of directors who had managed the concern so incapably; and unless the *employés* were really dishonest, the charge ought not to have been made.

Mr. JABEZ CHURCH said he fully endorsed everything that had been said by Mr. Livesey, and considered the accounts presented to the meeting were of the most unsatisfactory character. There was one question he should like to ask, because there were no means of ascertaining it from the report—viz., the amount of the unaccounted-for gas under the present state of circumstances; also, what amount of cash was received per ton of coal carbonized. There was no doubt that the capital (leaving out the water-works altogether, because he had no doubt that that would develop itself, and pay at least working expenses) was out of all proportion to the rental, and this excess of capital was a millstone upon the neck of the company. Regarding the management as most unsatisfactory, he advised the directors to resign. There were some gentlemen at the board for whom he had the highest respect, but there were others who ought not to have a seat there.

The CHAIRMAN, in reply to a shareholder, said there was an increase in the revenue during the last half year of £360, as compared with the corresponding period of last year.

Mr. C. HORSLEY said he came on to the board of directors at the time of the amalgamation of the companies, and could only speak of what had been done since then. Mr. Stokoe was, at the time he referred to, the local engineer and manager, and he was the cause of the company going to Finchley for water. No doubt, on that account Mr. Stokoe now spoke against the use of the old well. Since Mr. Stokoe's resignation the company had appointed another engineer (Mr. Martin), who, he believed, was a very capable man, and it was this gentleman, with others, who advised the utilization of the old well as far as possible, knowing that it must be some months, and might be years, before the Finchley works could be got into order. He (Mr. Horsley), under any circumstances, would recommend the same course, because of the economy in the cartage of coals. The company had put down 10-inch pumps in place of 6-inch pumps at Barnet, and now got 20,000 gallons more water than they obtained before, and even Mr. Homersham had advised that they should stop there, as there would be plenty of water for the district for some years to come. He (Mr. Horsley) wished it to be clearly understood that he and several of his colleagues on the board had nothing to do with going to Finchley. Those works were undertaken and the contracts entered into before the present company was formed. With regard to the gas-works, he might say that the engineer had not had the opportunity of showing the result of his working, inasmuch as the retort-beds were not yet ready. When the Patent Gas Company cleared out, two temporary beds were put up to enable the supply to be kept up, but in about a fortnight's time the engineer would be ready for the winter service, and he hoped at the next meeting to exhibit a satisfactory return. As to the cost of restoring retorts, the directors were using the money left them by the Patent Gas Company, so that there would be no charge upon capital for the outlay. The board were doing their utmost to promote economy and secure efficiency, and he felt sure that with a little patience on the part of the shareholders they would soon be out of their difficulties.

Mr. COX asked who it was that advised the company to go to Finchley. He had been told that the directors were warned by a practical man that, however deep they might bore, they would get no water, and yet they went on and spent £1300 without any result; whereas, if they had gone to the other end of the district, they would have obtained water at one-third of the depth.

Mr. HORSLEY said the works at Finchley were undertaken before the new company was in existence. Perhaps Mr. Stokoe could inform Mr. Cox by whose advice the then directors were guided. Mr. Homersham had told him that they would get water there, but they would have to go a considerable depth.

Mr. NEWTON said he thought the chairman had challenged remarks from the meeting, and therefore he must remark that when Mr. Stokoe and Mr. Humphrys had the management of the concern the shareholders got their 6 per cent. Under the new management they had not got a farthing. They were certainly entitled to some further explanations.

Mr. SAYERS said Mr. Horsley had no more to do with going to Finchley than he had. It was a pity the shareholders did not look into the matter before all the expense was incurred. If, instead of going to Finchley, they had gone to South Mimms, they would have had plenty of water at less cost. The money sunk in the well at Finchley had better remain there, for there would never be anything else in it. Referring to the accounts, he remarked that it was most extraordinary for £524 worth of coal to be necessary to pump £1272 worth of water in the half year. As to the supply of gas, he believed it had much increased in quantity and improved in quality. The income from that source could not fail to grow. In fact, with economical management, he believed that the whole concern would be better in the future.

Mr. LASS (the accountant of the company) said he thought if he said a few works respecting the accounts it might throw a little light upon the subject. When he was preparing a balance-sheet for a company he felt it his duty to prepare it as between man and man, just as much on behalf of the shareholders as of the directors. In all transactions, as between capital and revenue, he always made as much deduction in favour of capital as he possibly could, and charged everything in his power to revenue. The first question he would touch upon related to capital. He knew quite as well as Mr. Finlay could tell him that the capital of the company was altogether out of proportion to the revenue. It was, in fact, ten times larger than it should be, and it was almost impossible to get a paying dividend while this proportion existed. The next question was with regard to coals. It must be borne in mind that from January till the 25th of March the Patent Gas Company were manufacturing gas at the works, and the agreement with them really did not terminate until the 9th of November next. The matter was very seriously taken into consideration by the directors, and he advised them, if possible, to obtain the cancelling of the agreement in the spring of the year, so that the engineer might have the whole of the summer before him to get the works into order before the winter demand came upon him. If the agreement had continued in force till next November, it would have been quite impossible to supply the district with gas. The Patent Gas Company left them about 40 retorts, and it was found necessary to use the whole of them, and to use a large quantity of coal and fuel to manufacture even the small quantity of gas required for the summer consumption. As soon as possible after the Patent Gas Company left, the directors erected two beds of sevens, which enabled them to manufacture more gas than they wanted, and allowed of their letting down the other 40 retorts. The new retorts were not in operation till the end of May, so that, as far as the working of the last half year was concerned, it was useless to attempt any calculations. It was only now, as from the 30th of June, that they had been in a position to carbonize properly. It was impossible, under the circumstances, to tell what gas had been obtained per ton of coal, or what the cost of gas was per 1000 feet, or as to the quantity of coke realized for sale. It might, however, very easily be imagined that, having for a time to keep 40 retorts going where so much smaller a number would have sufficed, the coke account must be altogether wrong. The directors and their officers were thoroughly alive to all these things; and he could assure the meeting, both on his own account and that of the engineer, that they meant in the current half year so to keep the accounts as to be able, at the next meeting, to furnish every calculation that might be called for. He had made a small calculation with regard to the leakage for one half year, and he found it to come out at 20 per cent. He hoped he might be wrong; but he believed it to be the fact. Of course this ought to be reduced to 12 or 12½ per cent., and if they reached that it would be doing well. Mr. Livesey asked about the capital account—whether the cost of erecting the new retorts had been charged to capital. In reply, he could assure the honourable shareholder that not one penny had been so charged. The company obtained £300 from the Patent Gas Company, who also left behind them the whole of their retorts, a quantity of iron, and other things. He (Mr. Lass) immediately opened a special account, called the "Special Renewal Account," to which all expenses in the shape of restorations and renewals had been debited, and which account had been credited with the £300 in cash and the value of the old materials referred to. Up to the present time about £500 or £600 of expenditure had been charged to this account.

Mr. JABEZ CHURCH said there had been an addition to capital of £330 12s. 2d. since the last account. He should like to be informed how this sum had been expended.

Mr. LASS said the first item was £170 for erecting a wall around the bank of the brook at the works.

A SHAREHOLDER remarked that the wall had since tumbled down.

Mr. HORSLEY said it was built from Mr. Stokoe's design.

Mr. LASS said the next item of expenditure on capital account was £20 for a forge and bellows, purchased of the Patent Gas Company. A new steam-pump cost £40; a Lowe's jet photometer, £6; and four additional retort-benches, £165.

Mr. FINLAY asked what the total expenditure at Finchley amounted to.

Mr. LASS said when he first took up the accounts the well was three parts complete, and he could not dissect, from the accounts sent to him, the actual cost then incurred. But he believed, from an analysis of the accounts made by Mr. Humphrys, that about £12,000 or £13,000 had been spent there, which at present was totally unproductive.

The CHAIRMAN said it was much easier to find fault when the result of any particular course of action was known than it was to do so by anticipation. The directors of this company and of the previously existing companies had been guided in the steps they took by their engineers; and, with reference to the works at Finchley, he might remark that they were undertaken before this company was formed. He had been censured for the remarks made by him on the late *employés*, and all he could say in reply was that, if he were about to leave the board to-morrow, he should never regret that he had been the chief instrument in obtaining the change. And, as far as resigning his directorship was concerned, he would gladly retire if he did not feel that at the present moment it would be cowardly on his part. He was not surprised that the shareholders were angry with the half year's working, though he thought they had been rather too hard upon the directors. It was no doubt very disappointing to them; at the same time he could not feel that he or his colleagues had in the least degree neglected the affairs of the company. He trusted that during the present half year the directors would be able to get matters into a better condition, and that at the next meeting they would show a more satisfactory result.

The motion was then put and carried, and the meeting unceremoniously broke up.

FAILURE OF A GAS COMPANY.—At an extraordinary meeting of the shareholders of the Oughtibridge Gas Company, Limited, it has been resolved that, owing to the inability of the company, by reason of its liabilities, to continue its business, it should be wound up by voluntary liquidation, and liquidators were accordingly appointed. Some time ago the Sheffield Gas Company made an offer for the buildings and plant, which has now been accepted by the liquidators. For the last six months Oughtibridge has been without gas, owing to the failure of the local company; but now the Sheffield Gas Company will probably supply the village.

CARDIFF GAS COMPANY.—The half-yearly meeting was held on Tuesday last, Aug. 25, Mr. William Bird, chairman of the directors, presiding. The report of the directors and statement of accounts having been presented by the chairman, a dividend at the rate of 10 per cent. per annum on the A stock, 8 per cent. per annum on the B stock, and 7 per cent. per annum on the shares created by the Act of 1870, was declared payable on the 29th day of September. In the report of the directors it was stated that, in consequence of a reduction in the price of coals, the charge for gas would be reduced 3d. per 1000 cubic feet from the 29th day of September next. The thanks of the meeting were voted to Mr. Bowen, the engineer and secretary, and also to the chairman and directors, for their management of the business of the company.

WOLVERHAMPTON GAS COMPANY.

The Half-Yearly Meeting of this Company was held in the Offices, Queen Street, Wolverhampton, on the 25th ult.—Mr. J. UNDERHILL, chairman of the board of directors, presiding.

The SECRETARY (Mr. Jones) read the directors report as follows:—

Your directors have much pleasure in presenting their 45th half-yearly statement of accounts and general balance-sheet, duly certified by your auditor, showing the total receipts to be £22,880 15s. 3d., and the expenditure £19,351 9s. 9d.; leaving a balance of £3529 5s. 6d., which, added to the balance of last account, amounts to £4246 16s. 4d.

Your directors recommend the usual dividend of 5 per cent. to be paid, and propose to take the balance required for that purpose from the reserve-fund.

The usual repairs, alterations, and improvements of the works and plant, together with the renewal and enlargement of a gasholder at your Stafford Road works, have been in progress during the last three months, and will very shortly be completed.

In conclusion, your directors assure you that they will continue to pursue the same policy which has hitherto given general satisfaction to both proprietors and consumers.

The CHAIRMAN: After the few observations which I propose to make on the report you have just heard read, I shall move that the accounts and report be adopted and entered upon the minutes. The report is, as usual, very brief; and I think that the principal clause that will fix your attention will be as regards the net receipts of the half year and the dividend. You will probably not be surprised to find that, contrary to what has been usual, you have not made sufficient during the half year to pay the dividend. This, I shall endeavour to show, is not exactly a thing to lament over. It has arisen from circumstances which your directors were perfectly well aware of; and I think they have acted with some discretion in taking the course they have pursued—an opinion in which, after you have heard an explanation of the facts, I have no doubt you will coincide. You will remember that we brought in a balance of £700 and odd from last half year; and we shall now have to take out of the reserve-fund something like a similar amount to make up the dividend. That has all arisen from the unprecedentedly high price of coal. When coal first began to advance in price, your directors had very large contracts on hand at a low rate, and that enabled them for a considerable time to go on without any advance at all in the price of gas. I may here say that during the whole of the time coal has been so high, we have only made one small advance of 3d. per 1000 feet in the price of gas, making it 2s. 9d.; which, I believe, compares most favourably with any town or city in England. The reason why our last half year has been so much worse than previous half years is, that our supply of coal has all been at the very high price. We have not had any cheap coal to counterbalance this. When I tell you that the cost of our coal, reckoning the same tonnage as last year, has shown an increase of upwards of £2300, I think you will readily agree with me that this is quite sufficient to account for any falling off in the balance. Perhaps there are people who would say that this might easily be made up by putting something more on the price of gas. We felt, however, that we had in some measure the public to consider as well as our shareholders. In fact, the interest of the public and of the shareholders is, in the long run, identical. We felt certain the high price of coal was only of a temporary nature; and, that being so, we thought it best to continue our supply of gas at its present low price, trusting to the future to recoup what has thus been lost. That is the simple reason why the report is less favourable than usual. I am quite sure we need be under no apprehension for the future. With the contracts that have been taken, I have no doubt that by the end of the year we shall present a very different state of things, and not only be able to pay our dividend, but to recoup what we are out of pocket on this occasion. At all events, there will be no advance upon the price of gas this half year. We are taking steps, as stated in the report, for the extension of our mains, with the view of providing increased accommodation to consumers. Last year some complaints were received from outlying districts of a deficient supply of gas, this being caused by an increased consumption which was not expected. We are now making such alterations in the mains and increase in their size that we have no doubt during the present winter of our ability to supply all the outlying districts satisfactorily, and, as we hope, without any complaint at all. There is only one other subject I shall touch upon to-day. Most of you are aware that Wolverhampton is a very growing town, and that we have increased most remarkably in our consumption of gas during the last few years. Fifteen or twenty years ago a new Act was obtained for the increase of the capital of the company, and by that Act the then existing capital of the company was doubled. The same circumstances which existed then have arisen now, in consequence of the increased consumption of gas, the necessary extension of mains, &c.; therefore it became our duty to advise you to take steps to procure an increase of your capital. We now have the subject under consideration, and we have given the necessary instructions to your solicitor to prepare everything necessary for the purpose, and we expect he will shortly advise us that he is ready. By that time we shall have to call you together to consult with us, and advise what you will do in the matter. If we are to keep up the *prestige* of the company, we shall have to consider the desirability of increasing our present powers; for the great probability is that the increased consumption of gas, consequent upon the extension of the town, will go on as rapidly in the future as it has done in the past. Under any circumstances, however, I am quite sure your directors will do the best they can in the future, both for you as shareholders and for the public. I now move that the statement of accounts and report be adopted and entered upon the minutes.

Mr. COX seconded the motion.

Mr. MANBY, replying to Mr. Warner, said the company had no power to borrow any more money. He hoped, however, that they would be able to increase their capital by an application to the Board of Trade, instead of going to Parliament again, which would be a much less expensive mode.

The motion having been adopted,

It was resolved, on the motion of the CHAIRMAN, seconded by Mr. SAVAGE, that a dividend of 5 per cent. for the past half year, free of income-tax, be declared payable forthwith.

Mr. WARNER: I have much pleasure in moving a vote of thanks to the chairman and directors for the attention they have paid to the interests of the company during the last half year, as well as previously. Although the report is not quite so satisfactory as on previous occasions, the directors, I am satisfied, are not less entitled to thanks.

Mr. LANGMAN seconded the motion, and it was carried by acclamation.

The CHAIRMAN, in acknowledging the compliment, said: I assure you, as I before remarked, that we shall endeavour to do our duty in the future as I hope we have done in the past. I forgot to mention that we have not kept down the price of gas by any reduction of the quality; for I believe the gas we have supplied of late has been quite as good as in any previous year, if not better. This is a fact which I should like to go forth to the public. It has been a matter of anxiety to the directors what they should do under the circumstances. They decided to run the risk, and I think you will agree that they have acted wisely.

The meeting then terminated.

BELPER GAS COMPANY.—On Tuesday, the 25th ult., the half-yearly meeting of shareholders was held. Mr. S. Kiddy, the chairman of the company, presided. The accounts for the past half year were read by Mr. Ingle, the solicitor, and were by the meeting considered very satisfactory, and the usual dividend of 5 per cent. for the half year was declared.

READING GAS COMPANY.

The Half-Yearly Meeting of Shareholders was held on the 24th ult., when the following report of the directors and statements of account were presented and unanimously adopted.

The directors beg to present to the shareholders the statements of account and balance-sheet for the half year ended June 30, 1874; and have pleasure in again being able to recommend that full dividends be paid on the 1st of September next on all the stocks and shares of the company, in accordance with the scheme set out in the dividend account.

The coal market has been in a very unsettled state during the past spring, but your directors have made contracts for a supply for the current year, which they hope will prove advantageous to the company.

Your directors have taken much pains in making inquiries as to the various kinds of coal in the market suitable for gas-making, and in causing the samples obtained to be properly tested; and with a view to the more thorough testing of the gas-making properties of the coals, they have provided an experimental apparatus, which, they believe, will be highly beneficial to the company.

The contract for the supply of the public lamps for the current year has been renewed on the same terms and conditions as for the previous year.

The ordinary business of the company has been conducted by Mr. Baker, the company's engineer, and the other officers of the company, to the entire satisfaction of your directors.

Profit and Loss Account, June 30, 1874.

Dr.		*Cr.*	
Coals consumed	£5,423 14 9	Gas-rental	£9,195 11 3
Purifying materials	38 16 2	Coke	2,005 10 1
Meters	158 14 5	Tar and ammoniacal liquor	891 6 3
Fittings	14 9 3	Rents of tenements	12 15 1
Materials	411 0 11		
Contingency-fund	355 0 0		
Wages	1,644 14 2		
Salaries, &c.	719 12 6		
Tradesmen's bills	173 4 5		
Rates, taxes, &c.	472 15 10		
Interest	241 18 2		
Barge account	90 15 2		
Bad debts and allowances	50 6 0		
Miscellaneous	138 12 11		
Balance	2,171 8 0		
	£12,105 2 8		£12,105 2 8

Balance-Sheet.

Share capital paid up	£60,000 0 0	Cost of plant, &c.	£74,391 13 9
Mortgage debt	11,000 0 0	Amount due for light	4,083 4 1
Premiums on shares	3,524 0 0	Coke	916 14 9
Debts due to sundries, viz.:		Tar and ammoniacal liquor	591 2 5
Coal	1,493 11 10	Lime, &c.	0 8 0
Coke	10 0 11	Fittings	105 18 4
Purifying materials	9 4 0	Stock on hand—	
Fittings	29 13 5	Tar and ammoniacal liquor	115 6 8
Wages	2 15 0	Purifying materials	102 0 0
Materials	150 0 10	Coals	1,703 8 9
Tradesmen's bills	73 13 4	Coke	121 0 0
Barge account	39 14 2	Meters	81 8 0
Rates, taxes, &c.	453 8 11	Fittings	122 10 0
Salaries, &c.	103 14 0	Materials	769 5 0
Contingency	34 10 1	Office furniture	40 0 0
Miscellaneous	36 17 2	Barge	75 3 0
Balance contingency-fund	132 13 2	Balance in banker's hands	2,844 8 9
Unclaimed dividends	84 5 3	Petty cash in hand	65 0 0
Reserve-fund, £3000, and dividends accrued thereon, invested in £3590 18s. 9d., New Three per Cent. Stock.			
Balance brought from last account—dividend account	6,779 1 5		
Profit and loss account	2,171 8 0		
	£86,128 11 6		£86,128 11 6

ROCHESTER AND CHATHAM WATER-WORKS COMPANY.

The Half-Yearly Meeting of Proprietors was held on the 18th ult.—Mr. J. BAIRD in the chair.

The SECRETARY (Mr. Heckford) read the following report:—

The directors, in presenting their report and the accounts of the company for the half-year ended June 30, 1874, are glad to be able again to congratulate the shareholders upon the continued improvement in the prospects of the company. The receipts for the past half year amounted to £4479 16s. 7d., being an increase of £112 2s. 2d. over those of the previous half year, and £281 1s. 1d. on those of the corresponding one in 1873, while for the half year ended Dec. 31 last the expenditure has been £370 18s. 4d. less. The directors recommend that a dividend at the rate of 6 per cent. per annum (free from income-tax) be declared upon all shares for the half year ended June 30, 1874, such dividend to be payable on and after the 19th of September next. The directors also recommend that the sum of £400 be taken from the balance profits and added to the reserve-fund, and that the balance of £398 5s. 3d. be carried forward to the next account. The business of the company having been continually on the increase, there has been necessarily a large additional amount of work and responsibility thrown upon the secretary, and the directors have therefore much pleasure in recommending that his salary be increased by the amount of £50 per annum from the 24th day of June last. The effect of the drought in this locality during the past six months of the year was felt in the early part of July last, when the consumption of water suddenly increased to such an extent that the directors found it necessary for the safety of the towns to limit the supply to 14 hours per day; this immediately checked the consumption of water during the night, the greater part of which the directors are now satisfied was not required for legitimate use but was actually wasted. Since then there has been an ample supply of water to meet the requirements of the consumers. Some months previous to this occurrence the directors had taken steps with a view to deepen the wells and to make new and extensive adits at a lower level so as to obtain an increased supply of water. The work for carrying out the above object is now in progress, and when completed there is no doubt that a large additional supply of water will be obtained.

The report, after some conversation, was adopted, and on the motion of Mr. H. FOSTER, seconded by Mr. WILLIAMS, the best thanks of the shareholders were given to the chairman and directors of the company for the able manner in which the business of the company had been conducted.

A vote of thanks was also passed, on the motion of the CHAIRMAN, seconded by Mr. J. FOORD, to the auditors, and a similar compliment was tendered to the secretary and other officers of the company. It was further resolved that an addition of £50 should be made to the salary of the secretary.

In returning thanks, Mr. HECKFORD spoke of the progress of the company during the 10½ years he had been secretary. In 1863 the consumers were 1936, the income £3023; now the consumers are 4561, the income yearly, £8847; he would leave the facts and figures to speak for themselves. He thanked them for the kind manner in which they had marked their sense of his services during the 10½ years; also for the kind way they had thanked himself and the staff for their services.

The CHAIRMAN moved, and Mr. WITHECOMB seconded, a vote of thanks to the Rev. Mr. Stevens and the trustees, for the use of the schools for the purpose of the meeting, which was adopted.

This concluded the business of the meeting.

HOPE IRON-WORKS, STOCKTON—ANNUAL DINNER TO WORKMEN.—On Friday, the 21st ult., Messrs. Ashmore and While gave the workmen in their employ, with their wives, the usual annual excursion and dinner. The company numbered upwards of 170, and the dinner was provided at the Swan Hotel, Redcar. Congratulations were exchanged between masters and men during the proceedings, the former speaking in the highest terms of the conduct of those in their employ, the latter expressing their feelings of loyalty to the firm, and their satisfaction at witnessing the rapid growth of the business at the works. Altogether, a most agreeable day seems to have been spent.

SOUTH STAFFORDSHIRE WATER-WORKS COMPANY.

The Half-Yearly Meeting of this Company was held at Birmingham on the 27th ult.—Mr. F. James in the chair.

The following report was presented:—

During the half year ending June 30, 1874, the number of houses laid on has been 392, making the total now supplied 25,476. The increase in the revenue from water-rates, including trade supplies, has been £967 19s. 10d., and at the same time the ordinary working expenses have been reduced. In the item, "Maintenance of works," it has, however, been deemed prudent to include an unusually large sum for repairs and renewals of engines at Lichfield; but this charge is exceptional, and must not be regarded as an addition to the ordinary current expenditure. The balance remaining, after providing for interest on loans and preference shares, amounts to £3787 4s., and your directors, therefore, recommend the declaration of a dividend on ordinary shares at the rate of £5 per centum per annum, free of income-tax; the dividend warrants to be issued on Thursday, October 1, 1874. The engines are now in good working order, and, notwithstanding the large increase in the use of water, consequent on the continued dry weather, the total pumping expenses have been considerably reduced. Your directors have, however, had their attention forcibly drawn to the necessity for providing for a much larger demand throughout the district. The Government has for some time been strenuously urging on the local authorities a compulsory supply to all houses at present without water, and the number of such houses is very large, even within the limit of the company's existing mains. Beyond these limits your directors have received numerous applications from local boards for extensions, and although these extensions have been postponed in consequence of the non-compliance of the local boards with the stipulated conditions, your directors feel that the time is approaching when the great and pressing want of water in the localities presided over by those boards will induce them to perform their part of the compact; and the company will be enabled to lay the mains with advantage to the shareholders. In addition to this rapidly growing demand for water for domestic purposes, your directors are called upon to provide for a constantly increasing trade consumption, and, looking therefore to all the requirements of the company, your directors have resolved to make application to Parliament in the ensuing session for an Act to enable them to obtain further supplies of water.

Dr. *Profit and Loss Account, Half Year ending June 30, 1874.* *Cr.*

Engine charges	£3,919	13	10	Balance brought forward, Dec. 31, 1873	£3,157	8	7
Maintenance of works	2,315	11	10				
Wages, turncocks, &c.	463	8	8				
Directors attendance fees	125	0	0	Deduct amount of 25th dividend, declared Feb. 26, 1874	2,900	4	0
Salaries — secretary, resident engineer, and clerks	724	3	0		£257	4	7
Collectors commission	657	1	9				
Rents	316	6	10				
Rates	701	9	0				
Income-tax	104	2	8	Half year's water-rates	19,709	17	1
Incidental expenses	204	4	10	Service laying	235	8	8
Current law charges	138	4	1				
Discount to landlords	296	5	0				
Allowances	280	4	2				
Bad debts	21	18	8				
Interest on loans	1,879	15	4				
Ditto preference shares	4,273	16	8				
Balance carried down	3,787	4	0				
	£20,202	10	4		£20,202	10	4

Dr. *Balances, June 30, 1874, on Revenue Account.* *Cr.*

Sundry persons for goods supplied	£3,572	5	1	Sundry persons for water-rates, service accounts, &c.	£6,071	19	6
Ditto proprietors for unclaimed dividends	139	4	5	Stock on hand of lead and brasswork, coals, oil, and tallow, &c.	1,072	12	2
Ditto for interest on loans and preference shares	4,232	17	11	Balance at Bankers, June 30, 1874	4,630	10	2
Balance	3,787	4	0	Ditto in secretary's hands	6	9	7
	£11,781	11	5		£11,781	11	5

The Chairman, after alluding, with expressions of regret, to the circumstance that Mr. Sampson Lloyd was prevented, by an accident, from occupying his usual position as president of the meeting, said he believed this was the first time in the history of the company, which had been established for something like 21 years, that the directors had been able to come before the shareholders with a dividend of 5 per cent. In the accounts they would notice a considerable diminution in the engine charges. That was satisfactory, and arose, in the first place, from the reduced price which they had had to pay for fuel; and in the next place, from reduced consumption, in consequence of their machinery having been put into better order. The item for maintenance of works showed a considerable advance upon previous years, but that was decidedly exceptional. Some two years ago they entered into a contract for a new engine, but, in consequence of the failure of the contractors, that engine was not completed and fit for work for several months after the time, and the result was that they were obliged to run machinery which was in an inefficient condition, and the charges for repairs had therefore been heavy. Instead of paying for repairs out of the capital account, which had hitherto been done, they had paid the whole of it out of the revenue of the company. The charges for the engine repairs were therefore exceptional, and he was happy to tell them now that the engines were all, without exception, in efficient working order, and the pumping power of the company was never so good as it was now. It was a matter for satisfaction that the law charges were reduced. They arose solely because during the last half year they were harassed and irritated, as well as pecuniarily mulcted, in consequence of the proceedings which took place at Dudley, which they did not think were either fair or just. However, he was happy to tell them that those expenses were paid off, and he could only say, if the proceedings were not repeated, they would let bygones be bygones. The balance to be carried down was very satisfactory; and it was also satisfactory that the half year's water-rates had been continually progressing, and that during the past year they had progressed more than at any previous period. If they compared the figures with those of last year they found the water-rates had increased something like £7000—a very considerable sum. Those rates, in his opinion, had not been put at a point at which the public might justly be called upon to pay, but that was a matter which must be left to the directors, so that they might increase or diminish, according to surrounding circumstances. The last half year had been one of particular drought, and every one connected with water-works must have experienced much anxiety; but he was happy to be able to state that never during any previous period had the South Staffordshire Water-Works Company given a better supply than during the past half year. The supply had been continuous, and it must be satisfactory to them, because the public, in seasons of drought, were always larger consumers than at any other time. It was true some complaints had been made against the company of a non-supply of water at particular times, but there had not been any justification for some of those complaints. The diminution in the supply arose at one time in consequence of the repairs to the engines at Lichfield causing them to stop for a limited period. There were also occasional complaints in reference to the supply. When it was considered that they supplied about 25,000 houses, and when they knew the character of the district—that there was a much larger supply required on Saturday—they would not be surprised if the pressure of water was then not equal to the pressure at other times. They had had applications from many portions of the district for the supply of water, and to any district which complied with the Act of Parliament in making the application they had always given a supply. They had received many applications from local boards. Although they had power to lay down pipes in all those districts, they had not power to compel the people to pay for it, and were not accountable for the non-supply of water to houses the residents at which would not pay for it. They could not shut their eyes to the future; for there was evidence that there was an increased demand for water, and the price of water must inevitably rise. He thought that Parliament would soon compel a supply of water by landlords to every house which they owned, and they certainly must look forward throughout their own district in consequence of the increased population, and in consequence of the scarcity of the commodity, to an enlarged demand upon their resources. In reference to the directors resolution to make application to Parliament in the ensuing session for an Act to enable them to obtain further supplies of water, he wished to remove, if possible, any erroneous opinion that the company was at all proposing to extend its area. He told them distinctly that they had no such intention. They were not ambitious for any greater territory, and they were not antagonistic to anybody, but they should go to Parliament solely for the purpose of improving their supply. If they did this, the company must necessarily benefit. In conclusion, he said that they could now borrow on more favourable terms, and the company never was in a better pecuniary position than it was at the present time, and never in a better position to supply the district. He expressed a hope that they might receive the support of the public in going to Parliament for further powers to supply water to the district.

Mr. Jesson seconded the motion. He said there could be no difference of opinion that their water-works had been a great boon to the district, and he was sorry that they had received an amount of antagonism which was discreditable.

Mr. R. Williams said that he thought the complaints about the supply of the water were owing to the company having given such a liberal supply for years past, and when that supply became scarce it was only natural that complaints should be made. In regard to Wednesbury, for a long time past there had been an outcry that there was a scarcity, and sometimes an absolute stoppage of the supply. Having drawn attention to the difference between the water-rates paid at Handsworth and Wednesbury, he congratulated the directors upon the position of the company in being able to pay a dividend.

Mr. J. Barrow asked if it was the intention to apply to Parliament for power to increase the price of water supplied.

The Chairman said they were of opinion that Parliament would not listen to any application to increase the rates for domestic supply.

The motion was carried. Dividends of £5 per cent. on the preference shares entitled to the same (less income-tax); of £4 per cent. on the Dudley preference shares (less income-tax); and of £5 per cent. on the ordinary share capital (free of income-tax) were then declared.

On the motion of Mr. S. Booth, seconded by Mr. Williams, it was decided to increase the directors remuneration from £250 to £500; and the meeting terminated with the customary votes of thanks.

PARTICK, HILLHEAD, AND MARYHILL GAS COMPANY, LIMITED.

The Fourth Ordinary General Meeting of the Shareholders of this company was held in Glasgow on the 25th ult.—Bailie Cowan, Hillhead, presiding.

From the report of the directors submitted it appears that, after paying and providing for all current charges, and applying £1000 in reduction of preliminary and parliamentary expenses, there is a profit, including last year's balance, of £2693 9s. 6d., which the directors recommended to be apportioned as follows—viz., £469 12s. 3d. in payment of periodical interest at the rate of 5½ per cent. on the preference shares, less income-tax, and £1892 12s. 6d. in payment of a dividend of 2½ per cent. on the ordinary shares so far as paid up, free of income-tax, both payable on the 30th of September, the balance of £331 4s. 9d. to be carried forward to the credit of next year's account. The report stated that the revenue of the company is steadily increasing, and the result of last year's working is satisfactory, considering the many serious disadvantages which have had to be contended against. These are now overcome, and, judging from the largely increased number of consumers, and the prospect of additions to these in the course of the current year, the directors have continued confidence in the future prosperity of the company. There are now 5015 meters in operation, as against 3596 at last report. The directors recently acquired the business of the Bearsden Gas Company, which it is expected will be productive of good results. A large main-pipe has just been laid through the lands of Garrioch and Balgray, which will give an increased supply of gas to the Maryhill district, and enable the old works there to be disposed of. Part of the apparatus has already been sold. The additional piping laid last year exceeds 4½ miles in length.

The Chairman moved the adoption of the report, which was seconded by Provost Shaw.

Mr. Joseph Gardner criticized the amount of business that had been done as compared with the capital, and the method in which the dividend was paid. By recommending that £1000 of parliamentary expenses should be paid off, the directors were placing the company in a false position. They had been selling gas at 8 per cent. lower than it was sold in Glasgow, which would have brought them a dividend at the rate of 10½ per cent.

After a short discussion as to the paying off of the parliamentary expenses, the report of the directors was adopted unanimously.

It was also resolved that all shares on which there were arrears of calls should be forfeited.

The retiring directors having been re-elected, and votes of thanks accorded to the directors and the chairman, the meeting separated.

Gas Explosion at Liverpool.—On Friday morning an alarming explosion of gas occurred at the residence of Mr. Dickson, No. 5, Blackburne Terrace. The cook had laid the kitchen fire, and just when the light was applied there was a violent explosion of gas in the apartment. The glass in the window was broken, and the ceiling blackened, and the cook, who was alone at the time, was severely burned about the head and the upper part of the body. She was removed to the Royal Infirmary. It seems that some of the fittings in the lobby were defective, a quantity of gas had escaped during the night, and the light used for the purpose of kindling the kitchen fire ignited the gas which had accumulated in the lobby, the kitchen, and the lower parts of the house.

Glasgow Public Lighting.—Mr. Robert Millar, inspector of lighting in Glasgow, has issued a report giving some interesting facts regarding the lighting of the city. On the 28th of May there were in the five police districts—public lamps, 7836; private, street, and court lamps, 3222; common stair lights, 21,275; private lamps on public streets, 513; being a total of 32,846. The following table shows the quantity and value of the gas consumed in the various classes of lamps:—

	Cubic feet at 4s. 7d. per 1000.	
Public lamps	37,345,149	£8,558 5 3
Private, street, and court lamps	11,768,071	2,695 17 0
Private lamps on public streets	1,883,607	431 13 2
Total	50,996,827	£11,686 15 5
21,275 common stair jets, consuming 7-10ths of a foot per hour, charged at the rate of 11s. 10d. each per annum		12,353 17 6
		£24,040 12 11
Amount paid for gas for public clocks—viz., Tron Cross, St. Enoch's, St. Mark's, and St. Matthew's; also, £5 for lighting clock, John Street, Bridgeton, and cost of lighting clock, Springburn, not included in this sum		62 5 4
		£24 3

The 73 lamps on the five city bridges are included under the head of "private lamps on public streets," the cost of gas and lighting being defrayed by the Bridge Trustees. The lamps burn 3711 hours per annum.

ANTHRACENE AND ALIZARINE.

By FREDERICK VERSMANN, Ph.D.

(*Concluded from page 274.*)

Anthrachinon Test.—Heat in a flask 1 gramme of anthracene together with 45 c.c. of glacial acetic acid till it gently boils; add gradually, and at intervals of five to ten minutes, a solution of 10 grammes of chromic acid in 5 c.c. of glacial acetic acid and 5 c.c. of water. To prevent any loss of acetic acid during boiling, the flask is mounted with a condenser, which allows the acid constantly to flow back. About two hours gently boiling, in most cases, completes the decomposition, after which allow to cool, add 150 c.c. of water, and let stand for a couple of hours. Light yellow needles of anthrachinon separate from the green liquid. Bring the whole on a filter, wash the crystalline residue first with water, then with a very dilute, hot solution of potash, until the liquid runs off perfectly colourless; and, lastly, again with water, to remove traces of alkali. Now dry the filter in a water bath, and, when perfectly dry, detach the anthrachinon with a spatula, and weigh. This last direction is given in preference to weighing the residue and filter, because it has been found that the dilute chromic and acetic acid dissolve part of the filter, the original weight of which would thereby be altered.

Before calculating the anthracene from the anthrachinon obtained, a correction must be made. It has been found that 50 c.c. of acetic acid and 150 c.c. of water, as used above, dissolve 0·010 grammes of anthrachinon, which must be added to the weight actually found.

If the anthracene contains sand, or other impurities insoluble in acetic acid, a previous filtration through a small filter becomes necessary; very oily samples have to be pressed first between blotting-paper. Now, this test is based upon the argument that chemically pure anthracene yields the theoretical quantity of chemically pure anthrachinon, and that the other hydrocarbons are either destroyed by oxidation, or are converted into compounds readily soluble in dilute alkali.

I think, as far as the experiment with pure anthracene goes, the result may be satisfactory, and after having ascertained that the quantity of acid and water used dissolved anthrachinon, which corresponds exactly to 1 per cent. of the sample, the above correction may possibly be admitted, although it is rather a novel addition to analytical chemistry; but as soon as we have to do with a mixture, the conditions are changed, and such correction would make the analysis worthless. Another drawback is the necessity of detaching the anthrachinon from the filter, which is simply impossible without scraping off some paper and losing some crystals.

But a still more serious objection is the fact that some of the other hydrocarbons are acted upon in precisely the same manner as anthracene, and the products are as little soluble in dilute alkali as anthrachinon itself.

Phenanthren dissolved in acetic acid is very slowly oxidized by chromic acid, so that, after six or eight hours boiling, much is left unaltered; the phenanthrachinon forms needles of an orange colour, which melt at 205° C., and may thereby be distinguished from anthrachinon, which melts at 273° C., but phenanthrachinon is further decomposed in biphenic acid $C_{14}H_{10}O_4$; but this is a later reaction.

Chrysene, treated in a similar manner, yields also a chinon, in orange-yellow needles, insoluble in alkali.

Thus we see two, at least, of the impurities, and perhaps the two most important ones, form similar compounds to the one which should stand out alone in the whole series; the attempted separation is not complete, and the test is highly unsatisfactory. On the one hand the results are too low, and on the other they may be too high.

I had hoped to find in picric acid a means of separating the different hydrocarbons; but, as I have pointed out before, although the whole series forms picrates, the compounds are so little stable, and we cannot separate them with sufficiency accuracy, that an analytical method is not likely to result from the use of this acid.

At present, then, we must confess the want of an absolutely true quantitative laboratory test, and I am not very sanguine of complete success in this direction. I may compare the difficulties we have to encounter with those met with in the determination of the alkaloids in cinchona bark; here, also, we have a whole series of compounds, extremely similar to each other in their chemical and physical behaviour; here, also, we have one member of the series, the quinine, prominently standing out; and although the subject has been studied for many years, and although several methods have been proposed and are followed out, we must confess none of these methods gives entirely satisfactory and reliable results.

But if chemical science is at fault here, let the manufacturer make use of it, when it can assist him, in the improvement of his crude material; let him produce an article of high per centage, and he will thereby best assist himself in removing the difficulties in the valuation of his product.

In arriving at the second part of my paper, the conversion of anthracene into alizarine, I am almost afraid of touching it, because the few remaining minutes will only suffice to treat the subject in the most superficial manner, and because I must say a few words on madder and its preparations, the very life and existence of which are seriously threatened by this new industry.

In the East the madder plant has been known since the earliest times; from there it came to Greece and Italy, thence to the South of France, Alsace, Holland, and Germany. In Holland it has been cultivated more than 300 years; in France it has risen to great importance since the middle of last century, especially in Avignon, which now produces about one-half of all the madder consumed, to the value of about £750,000 per annum. Turkey and South Russia also supply considerable quantities of high quality. Some experiments in cultivating madder in this country have been made in Derbyshire, some years ago, but with indifferent results. The soil, the climate, and the weather have the most decided influence upon the growth of the plant, and the subsequent development of the colouring principle. The Dutch madder will dye red, but not purple, and the colour is not fast. Naples madder dyes good red and purple, but the colours are not fast; that of Turkey dyes good red and purple, and is very fast. France supplies the market with two qualities, called "rosées," from their dyeing beautiful reds and pinks, and "paluds," which gives a good purple, besides fine reds, and is the best French quality. The last name is derived from the fact that the plants are grown on marshy land.

The cultivation of the plant and the ultimate separation of the colouring principles is a matter of much time and uncertainty. The root must remain in the ground for a long time—in France two or three years, in Turkey five and seven years—and, after having been dried and coarsely powdered, it must be kept another year or two to develop the colouring principles which are not ready formed in the root.

For many centuries, and until the beginning of the present one, the root was used direct, and no attempt was made to separate the colouring matters or to apply them in a concentrated and pure form, but, with the development of technical industry and scientific investigation, the concentration or separation of the valuable constituents gradually commenced. The first step was the manufacture of "fleur de garance," madder deprived of all substances, soluble in water, and then dried again, which reduced the bulk to about 60 per cent. The washings contain a considerable amount of sugar, which, by some French manufacturers, is converted into alcohol. A ton of madder gives about 15 gallons of alcohol, of rather unpleasant flavour, but well adapted for technical purposes.

Garancine is madder further treated with sulphuric acid, which destroys part of the ligneous fibre, yielding about 25 per cent., in the form of a fine powder of light brown colour.

Alizarine verte and purpurine are the result of treating madder with sulphurous acid, which dissolves both. After adding sulphuric acid to the solution and heating to 40° C., purpurine separates about half or three-quarters per cent., and, on further heating to 100° C., alizarine verte separates about 3 per cent.

Yellow alizarine is obtained by further purifying this alizarine verte.

Extracts of madder are mostly obtained by treating the root with boiling water, collecting the precipitates which separate on cooling, mixing them with gum or starch, and adding acetate of alumina or iron. This is, in fact, a mixture of colouring matter and a mordant, which may be used for printing direct. These are the principal madder preparations, many of which are manufactured in this country.

In speaking now of the artificial alizarine and its manufacture from anthracene, the three principal links in this process are seemingly—

Anthracene	$C_{14}H_{10}$
Anthrachinon	$C_{14}H_8O_2$
Alizarine	$C_{14}H_8O_4$

The conversion of anthracene into anthrachinon does not offer any difficulty. It has been studied by Anderson long before any practical application ever was thought of.

Chromic acid or nitric acid readily effects the change, but chromic acid is preferable, inasmuch as nitric acid also gives rise to the formation of some nitro compounds. The crude product is readily purified by sublimation, when the anthrachinon is obtained in the fine yellow needles, which melt at 275° C.

Anthrachinon strongly resists the action of any oxidizing agent, and although Wartha succeeded in converting small quantities into alizarine by heating it with an alcoholic potash solution, still this direct oxidation is practically not possible; it therefore became necessary to further convert anthrachinon into a compound which, when treated with potash, would yield alizarine.

The methods of converting anthracene, not only into anthrachinon, but into a further substitution compound, form the principal subject of different patents, a short review of which will at once give the history of the rapid development of this new industry.

Graebe and Liebermann, the original discoverers, claim, in their first patent, the treatment of anthrachinon with bromine or chlorine, thereby obtaining bibrom or bichlor anthrachinon, which, fused with caustic potash, yields alizarate of potash, and this, in its turn, decomposed by hydrochloric or any other acid, leaves alizarine. They also obtain the bromine or chlorine compound without the formation of anthrachinon, by acting upon anthracene direct with bromine or chlorine, thus obtaining the tetrabrom anthracene or corresponding chlorine compound; this, boiled with nitric acid, gives bibrom anthrachinon.

$C_{14}H_{10}$ $\quad$ $C_{14}H_{10}$
$C_{14}H_8O_2$ $\quad$ $C_{14}H_8Br_4$
$C_{14}H_6Br_2O_2$ $\quad$ $C_{14}H_6Br_2O_2$
$C_{14}H_6K_2O_4$
$C_{14}H_8O_4$

Broenner and Gutzkow's patent, the next one, is so confused that it is difficult to clearly understand it; but it seems evident, among a great mass of irrelevant matter they point out, that the above treatment with bromine and chlorine may be substituted by the action of sulphuric or nitric acid. They claim to produce not only alizarine, but also purpurine.

Caro, Graebe, and Liebermann, in another patent, claim the production of the sulpho acid of anthrachinon by treating anthrachinon with sulphuric acid, removing excess of sulphuric acid by carbonate of lime, then adding carbonate of soda, evaporating the solution of the soda salt to dryness, and fusing it with caustic soda or potash. They also avoid the introduction of anthrachinon by treating anthracene direct with sulphuric acid, and obtain the bisulpho-acid of anthracene, which is converted into bisulpho-acid of anthrachinon by means of an oxidizing agent, such as peroxide of manganese.

$C_{14}H_{10}$ $\quad$ $C_{14}H_{10}$
$C_{14}H_8O_2$ $\quad$ $C_{14}H_8(HSO_3)_2$
$C_{14}H_6(HSO_3)_2O_2$ $\quad$ $C_{14}H_6(HSO_3)_2O_2$

The first part of the last patent—viz., the formation of the bisulpho-acid of anthrachinon, is also claimed by Perkin, in a patent dated one day after Caro, Graebe, and Liebermann's.

Perkin holds also the next patent, in which anthrachinon is again avoided. Bromine or chlorine compounds of anthracene are acted upon by sulphuric acid, and the result oxidized by peroxide of manganese. Dale and Schorlemmer have further simplified the reaction; they boil anthracene with sulphuric acid, remove excess of acid by carbonate of lime, and treat the solution with caustic potash and nitrate or chlorate of potash. The last patent has been obtained by Meister, Lucius, and Bruening; this embodies the treatment of anthrachinon with fuming nitric acid and production of mononitro anthrachinon.

I can do nothing but give the reactions which are intended to be produced, without attempting to allude to the great delicacy of the operations. I need scarcely say that at every step the most attentive care is required, because almost every reaction may either be not carried far enough, or may be carried too far, and in either case total or partial failure in the manufacture must be the inevitable consequence.

I have merely given the seven patents because they will best show the tendency to simplify the original elaborate and costly processes, and that this has been effectually done is shown by the large quantity of alizarine produced, and by the great reduction in price.

The artificial product is mostly sold as paste, which is better applicable than a dry powder, which would not mix so well and uniformly. Of course this paste is not chemically pure; but, whereas two years ago many samples did not contain more than 5 per cent. of alizarine, the quality has now vastly improved.

Pure alizarine may readily be obtained by evaporating the paste, and then extracting the colouring matter, or by sublimation, as shown by different specimens.

Great doubts were at first expressed as to the quality of the dye compared with that of madder preparations, but they seem not to exist any longer; it has been convincingly proved by Boley, Kopp, Schunck, Perkin, and others, that the natural and artificial alizarine are identically the same, and the same results are produced.

The question of price has also been settled; whereas, not two years ago, the difference was greatly in favour of madder, it is now about the same in consequence of the greatly increased production.

There is now one factory in this country, founded by Perkin; one in France, and more than a dozen in Germany and Switzerland. Some idea of the extent of this manufacture may be formed from the fact that last year more than 1000 tons of 10 per cent. paste were produced, in value of £500,000, and it is stated that one German firm are preparing to make 500 tons a year.

The effect upon the madder cultivation has naturally been most serious, and especially at Avignon the question is most anxiously discussed whether the artificial alizarine will ultimately drive the madder out of the market altogether. The vitality of the new product is more than secured, but although it must very seriously injure the madder interest, it need not necessarily kill the natural product altogether. There may be room for both, and an increased production may, and undoubtedly will, ensure a vastly increased consumption.

Such effect we have seen with the introduction of aniline dyes; a whole

series of new compounds of formerly unknown shades have sprung up, of a total value of about £2,000,000 a year, and have they thrown any of the old dyes, madder, or indigo out of the market? No; new applications have been found, more coloured articles of every description are used; and so it will be the same with alizarine—the more it is manufactured, the more it will be used.

No doubt the madder growers will have to struggle hard in the competition, and of this they seem to be aware already. Only the other day the Agricultural Society at Avignon inquired of the Industrial Society at Mulhausen what they had to fear of artificial alizarine. The answer was, that to successfully compete, they must improve their product; they must not only sell the raw material, containing but a few per cent. of valuable matter, but they must call in the assistance of science; they must manufacture the extracts of such quality as is made in Paris and England; but that it was impossible to drive the artificial product out of the market again. In such manner the artificial alizarine will have the merit of improving the quality of its ancient rival.

But even supposing madder cultivation were destined to die out, would the ultimate general advantage not more than compensate the individual loss? Many thousands of acres of land would be set free, and would with other crops give a better return than now, when the root must remain for years in the ground. Seldom, if ever, have such splendid results been obtained in so short a time. Here we see a most unpleasant and perfectly useless greasy substance suddenly turned into one of the most beautiful colouring matters; a new application for immense quantities of various chemicals is found, a number of important manufactures is started, the effect of which is felt more deeply than we can be aware of. And science itself, in accomplishing this revolution, largely profits by it, because the investigation of all the connecting links has of late years given us an insight into the internal arrangement and constitution of these chemical compounds hitherto unknown.

To England especially the practical part of the question is of the greatest importance, because, after all, England is the great tar-producing country, and the principal supply of anthracene must always come from here. The nine London gas-works alone convert about 1½ million tons of coal into gas, and produce about 12 million gallons or 60,000 tons of tar a year. The gas companies have not been slow in profiting by this invention; the price of tar has already been more than doubled, an increase almost sufficient to reduce the price of gas 1d. or 2d. per 1000 feet.

And, finally, must alizarine be the only colour derived from the solid hydrocarbons? It is very likely that others will be produced from anthracene and its homologues.

Boettger has already separated an anthracene orange of great dyeing power; Springmuhl has succeeded in obtaining a most beautiful blue, the only drawback in the manufacture of which is at present that it would cost about £600 a pound; but one might almost say this is the least difficulty, because the compound once obtained, an easy and economical process of manufacture is almost sure to follow. But while we are thus waiting for further triumphs in this and similar directions, let us not forget to honour and admire the perseverance, energy, and industry of those scientific minds who, whatever their nationality, have contributed in solving the great problem of imitating and outrivalling Nature's silent working, and who have succeeded in producing, on scientific principles, one of the most lovely natural colouring matters.

DOMESTIC WATER SUPPLY AND WASTE WATER PREVENTION.

At the recent meeting of the British Association for the Advancement of Science, Mr. G. F. Deacon, of Liverpool, read a paper in the section of "Mechanical Science," on his waste-water meter, a description of which, with illustrations, was given in the JOURNAL last year. The president, Professor James Thomson, called on Mr. F. J. Bramwell, F.R.S, one of the vice-presidents of the section, to open the discussion, and that gentleman, in doing so, addressed himself, not merely to a consideration of the apparatus brought under notice by Mr. Deacon, but to the more important question raised by it—the nature of domestic water supply, whether it should be constant or intermittent.

We append a report of his speech:

Mr. F. J. BRAMWELL, F.R.S., V.P., opened the discussion with the following remarks. He said he was glad that Mr. Deacon's paper had been brought before the section, first, because it described a novel and an ingenious apparatus for detecting and registering the waste water; and, secondly and principally, because it raised the general question of the nature of water supply for domestic purposes. He believed there were few more important subjects connected with sanitary science, which properly came within the scope of Section G, than the apparently simple one—What should be the nature of that supply? Should it be intermittent, or should it be constant? And he trusted he might have the permission of the section to make a few observations on this much-vexed question before he offered some remarks upon the waste water meter itself and upon his experience of its practical working. Generally, the seller of an article was not concerned in seeing that the purchaser exercised economy in the use of it—indeed, his obvious interest lay in the opposite direction. But the persons who supply water are in a very different position. In their case the customer does not, for domestic purposes, "burn by meter," to borrow a phrase from the gas-works, but he pays an annual sum, based commonly on the rental value of his house, and whether that house has but few occupants or whether it be crowded, and whether the inhabitants use the water fairly, as they would use their gas, or whether they waste water, the sum to be received by the water company does not vary. He would not attempt to go into the question of the feasibility of solving the question by the general employment of water-meters for the domestic supply, and he would therefore deal with the subject on the assumption that, as heretofore, water would be paid for by an annual charge, irrespective of the quantity used, and that then there would not be applied to the employment of water, the salutary check of its being to the consumer's immediate pecuniary interest to use no more than he really requires. This being so, there is undoubtedly liability to waste; and those who have the charge of water supply to a town must at once determine how that waste is to be, if not prevented, at least limited, and brought down to a known and definite quantity, which cannot be exceeded. The obvious way of attaining this end, and the way that was at one time generally adopted, was to give an intermittent and a brief supply. He could remember, many years ago, it is true, when the water was said to "come in" three times a week only, and that on each occasion it "came in" during only one and a half to two hours. With such a system, the consumption and the waste of water can be controlled to a certainty. The size of the pipe and the pressure being known, the engineer can tell how much will be delivered into the cisterns in a given time, and thus he can ensure that not more than this quantity shall be used or wasted in any one day. The system of intermittent supply thus affords an obvious, a comparatively simple, and a partially efficacious remedy for waste, certainly for gross waste; but these are the only things to be said in its favour. On all other grounds intermittent supply is most undesirable—in fact, there are such evils attendant upon it that it should not be suffered to longer endure. He would not dwell upon the cost of maintaining a large staff of turncocks, nor on the fact that householders were dependent on the punctuality and attention of these men. Nor would he even do more than allude to the circumstance that there was great liability, with the intermittent system, to delay in obtaining water for extinguishing fires; but he would at once go to the fatal defect of the submitted system, that of the obligation of cistern storeage. He believed that most serious injury to health had been occasioned by the system of cistern storeage. Cisterns were of necessity cumbrous. They had to be put somewhere out of the way, and commonly careless or ignorant builders or architects fixed them in all but inaccessible places, where they were out of sight and out of mind, and thus attention was not paid to keeping them clean, and all sorts of filth accumulated; but, bad as this was, it was not the worst, for too commonly the cistern for general purposes was placed in close proximity to that part of the house from which it ought on every ground of health and of common decency to be the farthest away, and it appeared as though the very effort of the constructor of such houses was to make arrangements for the express purpose of contaminating the water. Those who travelled on the suburban railways of London, and observed the backs of the poor dwellings in the neighbourhood of some of those railways, must have noticed that commonly the only cistern was exposed to the full heat of the sun, and was carried on the top—in fact, formed the roof of an outbuilding from which filthy gases emanate, to be absorbed by the water, and thus that which should be the source of cleanliness and health was fouled and poisoned as a preparation for its use. That water could be rendered the carrier of disease by the absorption of foul gases he presumed few present would doubt; but he might refer them to a statement in *The Times* of Aug. 17, where it was shown that typhoid fever had been communicated to a number of cottages by the vapour from a drain, in which the slop water of the washing of the linen of the first patient suffering from that fever had been thrown. By placing cisterns where they could receive foul gases, he had no doubt but that disease might be spread through a house; but worse than this, the intermittent system was attended (when the supply was shut off, and the lower cisterns were filling from the water remaining to the higher parts of the pipes) by an indrift into the general service-main; and in this manner, as was well known, foul gases, and, in some cases, even foul liquids had been drawn into those mains; and thus disease was laid on from one house to another. The constant service afforded an agreeable contrast to this catalogue of loathsomeness. The water being always at full pressure in the pipes, all that is required is to turn the tap and draw the water cool, and as pure as it may be when supplied unpolluted by foul gas or by foul liquid. But it is said by those among water-work engineers and managers who still advocate the intermittent supply, that, even assuming all these things to be true, the intermittent supply is a necessity. The waste of a commodity that is not paid for according to the quantity used, but is paid for in an annual rate, must be so excessive if the service is constant, that, whatever may be the evils of intermittent supply, they must be submitted to as the only means of preventing gross and unbearable waste. But the fallacy of these arguments has been exposed, and so successfully exposed, by the advocates of the constant supply, that the Legislature has for many years past insisted on inserting in each Act for the supply of water to provincial towns a clause to secure constant supply; but this legislative care is operative in provincial towns only, and there is one most important exception to this otherwise now general rule, and that exception, unhappily, is in the case of the metropolis. In London, with its three and a half to four millions of inhabitants, the water supply is given over to eight companies, who reign supreme; the metropolis is divided into districts, each company has its own, there is no competition, no new company is permitted, and London is powerless. Various checks have been suggested, and some have even come into operation, but the result is that, practically, the companies do as they please. He was not aware that this paper was coming on, and therefore he had not prepared himself before leaving London, and was speaking now from memory, but according to his recollection, it was between 10 and 20 years ago that an Act was passed to give constant supply to London; but that Act was a perfectly dead letter, as the section would readily see when he told them that, before a company could be compelled to afford a constant supply, it must be demanded by a very large majority (his recollection was three-fourths or four-fifths) of the inhabitants who were served by a "district main." It turned out that the term "district main" had no recognized meaning, and that it was impossible to tell what group of houses would satisfy this term; the result was the Act was never put into force. About three years ago an Act was passed to cure the blunder in the former Act, and to obtain a constant supply for the metropolis. One of the provisions of that Act was that, within six months, the water companies should frame a set of regulations for the "fittings," and that these regulations should be submitted to the Metropolitan Board of Works, who, if they disapproved them, were to be heard before the Board of Trade. The eight companies drew up their regulations. The Metropolitan Board of Works did him the honour of referring these regulations to him for examination and for a report, and, as he considered them most oppressive, he advised they should be opposed. He trusted the section would bear with him while he mentioned one or two of the clauses of the regulations. The use of cisterns must be continued, nevertheless all the pipes throughout the house must be replaced with pipes of a great strength, unless, indeed, they happened to be of the excessive thickness demanded, which, however, was most unlikely. If there were a bath in the house, it must only have one opening for inlet and for outlet, so that the clean water must come in through the dirty outlet. Moreover, it must not have a waste-pipe, because the water might be left on accidentally, and, if so, the owner should be punished by the baths overflowing and spoiling his ceilings and walls, and, perhaps, a few pictures. Cisterns were not to have any overflows except of a particular kind—that is, they were to be brought through the house wall into a place where the officer of the company could see them. When it was objected that this would in many cases involve great length of pipe and serious cutting away of plasters in order to carry the pipe down within the house to about the pavement level before bringing it through the wall, it was said, "Oh, bring it out through the nearest wall at whatever floor the cistern may be;" and the representatives of the company did not see any particular objection in the fact that any householder who did this would be liable to an action for damages for suddenly giving a shower-bath to a passer-by, and they seemed to think the suggestion that ladies would not like to have good dresses or bonnets thus spoilt an idle one. The commissioners before whom the regulations were discussed very greatly modified them in favour of the public; but, nevertheless, the Act is still practically inoperative, and probably will be, till another outbreak of diseases causes fresh alarm. During the discussion on the question of constant supply to London, the advocates for it instanced Norwich, where, under efficient supervision, the consumption per head fell from between 25 and 30 gallons per diem, on the intermittent system, to 15 gallons on the constant. Manchester, a large city, where the result has been nearly as markedly favourable in relation to the constant supply; and Sheffield, a town where it has been most successful, the supervision there having brought down the consumption to many gallons per head less with the constant than with the intermittent supply. On the other hand, the supporters of intermittent supply in the metropolis have said, "Look at Liverpool. Here is the case of a town which began on the constant supply and had to give it up, the waste was so great." No doubt this was so, and it was always felt to be a powerful argument in favour of the London advocates of an intermittent supply. They said, in effect, the requisite supervision becomes unfavourable in large towns (although Manchester was a success), and thus Liverpool was made a standing reproach to the constant supply system. Liverpool was on the intermittent service when Mr. Deacon was selected to be the engineer to the Water Committee. Happily for Liverpool, and happily for the question of constant service, Mr. Deacon was not content to fold his hands and put up with things as he found them without an attempt to better them. He saw the expense and difficulty attendant upon a house-to-house inspection of the fittings; he knew how offensive such inspections are to those who are behav-

ing properly and honestly; and he set himself to devise an implement by which he should be able to form a very good idea in which houses waste was going on, and to inspect those houses and those only. His reflections on the subject had resulted in the waste-water meter which was now before them. This had been successfully in operation in several of the districts where the Water Committee, before determining on adopting it generally, thought it advisable to have an independent opinion on the subject, and they requested him to investigate into and to report on it. In consequence of this report he put himself into communication with Mr. Deacon, and visited Liverpool. He first tried the meter, under very varying heads, delivering water into tanks of known capacity, to ascertain the correctness of its registration. This he found to be very satisfactory. He then spent the greater part of two nights in the streets of Liverpool, going with the inspectors through two districts to which the meters had just been applied. The results were most striking. On visiting one of the meters at midnight it showed a consumption of about 3000 gallons per hour. Going on passing through the district, the inspectors applied the key to the stop-cock outside each house, and on the ear being put to the top of the key, the presence or the absence of sound indicated whether there was water running through or not. By closing the cocks when the noises were heard, and leaving all the others open, it was found on revisiting the meter that a waste of 2200 gallons an hour had been arrested. The few houses where the stop-cocks had been closed were noted, and these houses alone were the subject of visits from the inspectors on the following day. He believed the apparatus was one which might be thoroughly relied on as not likely to get out of order, and that it would enable perfect control, at the least possible cost and with the least annoyance to the inhabitants, to be maintained over a district; and he thought the Corporation of Liverpool were to be congratulated for having selected as their engineer a gentleman who, by his intelligence and inventive talent, would not only save the corporation many thousands a year, but would restore the boon of constant service to Liverpool; and he further thought the advocates of that service throughout he country and all those who were interested in sanitary science (in truth, that meant the whole population) were indebted to Mr. Deacon for having made this important improvement in facilitating the adoption of constant service.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

There is not much movement to be recorded in the local iron trade, but it may be said that the larger foundries continue to be very well engaged on pipe work and general descriptions of castings. North Yorkshire pig iron is in fair request for foundry purposes at the following figures:—No 1 foundry, 76s. 6d.; No. 2 foundry, 73s.; No. 3 foundry, 71s.; No. 4 foundry, 65s.; No. 4 forge (grey), 58s.; No. 5 forge (mottled), 57s.; No. 6 forge (white) 56s.; refined metal, 86s.; Kentledge, 67s. 6d.; and cinder pig, 50s. per ton for net cash delivered in the Tees.

The coal trade is not very brisk, but a better tonnage is going by rail to London. House coal is 13s. to 16s. per ton, and steam coal can be bought at 11s. to 13s. at the pits.

It is stated that the Dodworth Silkstone Colliery Company has entered into a contract with the Bradford Corporation to supply 30,000 tons of gas coal during a given period, and rumour has it that the price is 13s. per ton delivered at Bradford. The carriage from this colliery to the town named is 2s. 3d. per ton, so that the price of the coal would be 10s. 9d. at the pit.

The arbitrators on the colliers wages question having decided that the men must accept the further reduction of 2½ per cent. (for a minimum period of three months) they are all at work again, except the pits of Earl Fitzwilliam. These will probably resume in a few days, the questions in dispute being as to the terms of tenancy of his lordship's houses by the miners, and the quantity of shale to be allowed per corf.

At the half-yearly meeting of the Wakefield Gas Company a profit of £4090 was shown. The price for coal was stated to be 12s. 6d. per ton, but the contract would shortly run out. Dividend of 10 per cent. on the old, and 7½ per cent. on the new shares, was declared.

The new reservoirs for the Pontefract water supply are being rapidly pushed forward.

At a special meeting of the Doncaster Corporation held on Friday, the tender of Mr. James Thane, of Maryport, at £42,538, for the construction of the three new reservoirs, &c., was accepted. The total storeage capacity will be 290 million gallons.

The Oughtibridge Gas Company has been wound up, and the buildings, plant, &c., have been sold to the Sheffield Gas Company.

A scheme for the water supply of the Stocksbridge district is being ventilated. It is proposed to construct a reservoir at Machen Springs for that purpose, to hold 570,000 gallons, and to lay thence 6-inch mains for the supply of the district.

The Mexborough Local Board are looking after an improved water supply, and have empowered an engineer to make trial sinkings.

IRON AND COAL TRADES OF SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE.

(FROM OUR OWN CORRESPONDENT.)

Rather more animation is noticeable in the finished iron trade since last report, the mills and forges are now tolerably well employed, and makers generally adhere firmly to their late quotations. The inquiry for hoops, plates, and sheets shows increased activity, but the larger specifications are still withheld in expectation of easier rates; while, on the other hand, makers do not care to book more orders than will suffice to keep their works in steady operation for a little while ahead, and, as most of the mills have a fair supply of orders on hand, there is less underselling going on, and also less competition for the orders that are in the market. It is a matter of satisfaction to find that at current rates the Belgians are less able to contend with this country than they have recently been, and, excepting hoops, the importation of Belgian iron is now very trifling. The colonial demand for tubes and galvanized roofing sheets is still fairly active, and producers speak more hopefully of the aspect of the trade. Pig iron is in somewhat improved request, and additional furnaces continue to be relighted in various parts of the district; but the North of England and South Wales makers are selling a good quantity in South Staffordshire at prices which cannot be very remunerative to themselves. Hot-blast all mine is quoted £5 10s. to £6 15s.; grey forge, £6; cold-blast, £6 10s.; and cinder, £3 to £3 5s.

The price of coal is substantially unchanged, though fuel of all descriptions is in abundant supply, and it is argued that this plethora must soon bring the trade to something like its normal condition. There is now no difficulty experienced with the colliers, who are anxious to work in order that they may make up for the long strike. A colliery manager of large experience stated recently that he never saw so much coal raised per man as is now being brought to the surface.

It is now generally believed that, on the conclusion of the present agreement with the men, a further reduction in wages will be declared.

IRON AND COAL TRADES OF LANCASHIRE.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of this district shows a slightly improving tendency. Generally a steady business is being done for the time of the year, but there is still a withholding of orders for forward delivery. In the Manchester district some of the large firms have at present more orders on hand than they can attend to, but steam fuel is not generally brisk, and in this description of coal there is still some underselling, though not to the extent that previously existed.

In the principal coal-producing districts of West Lancashire rather a quiet tone prevails, and the output is in excess of the demand. Stocks of best house coal are accumulating, and, although quotations nominally are unchanged, there is a gradual working downwards of prices. The average Lancashire pit prices range about as under:—Arley Mine, 15s. to 15s. 6d.; common house coal, 10s. to 12s.; burgy, 8s. to 9s.; and good slack, 6s. to 7s. and 7s. 9d. per ton.

The coke trade is a trifle steadier. For Durham foundry cokes, delivered in this district, there is a good demand at the late reduction, and, amongst Lancashire makers, there is not quite so much forcing of sales.

No result of the private meeting in Wigan, on Tuesday last, between representatives of the masters and the men in regard to the proposed reduction of wages in West Lancashire, has yet been made public; but from trustworthy sources I learn that the masters laid before the men the most convincing proofs of the necessity of the lower rate of wages. The men, however, very strongly opposed the full reduction of 15 per cent.; but there seemed to be a disposition amongst the masters not to insist upon more than 10 per cent. if the men would consent to work more regularly than they have done of late. It is hoped, therefore, that some amicable arrangement may be come to.

There has been a manifest improvement in the condition of the iron trade during the past week. Some of the forges are as full of orders as they can undertake, with a prospect of activity for several months to come. Founders are also very busy, although in exceptional instances there are complaints. There can be no question as to the general briskness of this branch of trade. Forge iron has improved in price, and there has been a good inquiry for forward delivery; but the demand for foundry iron has been affected by the rather easier condition of prices in Middlesbrough. Quotations range about as under: No. 1 for September delivery, 84s. 6d. per ton; No. 3, 78s. 6d.; No. 4 (foundry), 74s.; No. 4 (forge), 68s. 6d.; mottled, 67s. 6d.; and white iron, 66s. per ton. Puddled bars show a firmer tendency, the quotations being £6 15s. per ton, less 2½ per cent., in rather more inquiry. In ordinary bars some of the local makers have advanced their prices 5s. per ton during the past week, and quotations range from £9 15s. to £10 per ton delivered.

COAL AND GENERAL TRADE OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

As the nights begin to lengthen, the large collieries in this district, holding heavy contracts with the gas companies of London and the South of England, show a very active business. Terms for shipping at these pits may be described as lengthy, but the numerous other Durham pits engaged in the gas trade which are not so fortunately placed are not doing a very active trade. They are able to give the gas-works buying coals of them immediate shipment, and prices are about the same low range that they have kept at during the past two months, and so long as the local demand for manufacturing coal continues in its present depressed condition it is not probable that there will be much change in second-class gas coals. The inquiry for the best and better sorts of steam coal is very well sustained, but for all other sorts there is little or no inquiry, and though the coalowners are endeavouring to rid the market of surplus stock by sending cargoes abroad on consignment, nearly all kinds of small coals continue to be a drug in the market, and may be had, as a rule, at anything offered for them.

The Durham and Northumberland miners have formally declined to make a reduction upon their present rate of wages. The subject has been much discussed, and is still open to negotiation, but at present the coalowners hold out for that which is about equal to 15 per cent. reduction, and the men refuse to accede to any other terms but the current rate of wages. There is an impression that the whole question will go to arbitration.

Shipping freights fell considerably last week, especially for the Mediterranean, where the rates came down £2 per keel; and there was hardly any inquiry for coasting tonnage. Any quantity of iron steam tonnage is available in the freight market, and coal rates are likely to be low for the remainder of the season.

The demand for forge qualities of pig iron continues to increase in the North of England, while that for foundry declines. The finished iron trade generally is quiet, and upon the whole the business done in the Cleveland district last week was moderate. The trade generally, however, is steady, and the majority of railmakers have a fair amount of work on hand. Iron shipbuilding, also, is satisfactory; so that, while there is not much of a speculative character about the iron trade of the North of England, it keeps improving in tone.

The chemical trade of the North of England was quiet last week. Merchants were not pressing for business, and wanted more discount than manufacturers were inclined to give. The chemical trade here is very deficient in tone, but its prospects are better. Coal is getting lower, and there is no doubt the abundant harvest that has been secured will give an impulse to manufacturing trade, which will react upon chemicals.

GAS EXPLOSION IN GLASGOW HARBOUR.—On the 25th ult. a serious explosion took place on board the schooner Madge Wildfire, then lying in the harbour, by which Captain John M'Lean, John Reid (carpenter), Donald M'Kinnon, and Edward Gibbons (seamen) were more or less severely injured. A barrel of oil which was in the hold having got broken, the contents were spilled on the bottom of the vessel. The crew having gone down into the hold with a lighted candle, for the purpose of examining the pumps, an explosion took place from the gas arising from the oil. The hands and faces of the four men were severely burned. Captain M'Lean was at once conveyed in a cab to his residence; he was severely burned about the face and hands. The rest of the injured were removed to the Royal Infirmary. The vessel sustained no damage from the explosion.

WAKEFIELD GAS COMPANY.—The fifty-fifth half-yearly meeting of this company was held on Monday, the 24th inst.—Dr. Wood in the chair, Mr. Statter, the chairman of the company, being dangerously ill, The revenue account showed liabilities £11,898, with a balance of £4090 as profit. The revenue had been £16,929, being £1000 increase for gas. The total capital was £74,941. 800 tons of coal were on hand. Though selling at 9s. 6d. a ton, 12s. a ton was given for coal, but it was hoped to get it at less shortly. The accounts were passed, and a dividend of 10 per cent. was declared on the old shares, and of 7½ on the new, with a balance of £800 to the reserve-fund, the gas being now 3s. 6d. per 1000 feet. The leakage at the gasholders was only 10 per cent. The three retiring directors—Messrs. Statter, Senior, and Aked—were re-elected, an amendment to substitute Mr. R. Whiteley for Mr. Aked being lost by the casting vote of the chairman. Mr. Ellerton was reappointed auditor.

ACCIDENTS AT THE SHEFFIELD AND MANCHESTER GAS-WORKS.—An inquest was held at the Sheffield Infirmary, on the 16th and 25th of August, on the body of Allen Walker, a plumber, 22 years of age. On Wednesday, the 12th of August, the deceased was standing near an archway in the new gas offices, Commercial Street, with a companion. Whilst in this position a box of bricks was being hoisted by the contractor's men to the top of the building, but when about a foot from the summit two bricks fell from the box, and the consequence was that one of them struck Walker on the head, producing concussion of the brain. He was removed

to the Infirmary, but died the following night. The jury ultimately returned a verdict of "Accidental death," and added: "That the way in which the bricks were hoisted from the ground to the top of the building was dangerous, and especially by too many bricks being put into the tub at once; and, further, that according to the evidence, the chain and tackling were inefficient and dangerous, and recommend that greater precautions be taken to prevent such accidents in the future."—An inquest was held at Manchester, on the 24th ult., by the City Coroner, with reference to the death of George Scattergood, aged 35, and store-keeper at the Rochdale Road Gas-Works. On Thursday afternoon (Aug. 20) the deceased was descending a ladder at the works where he was employed, carrying some dinner-pots in his hand, when he lost his hold and fell to the ground, a distance of 14 feet, sustaining concussion and laceration of the brain. He was conveyed to the Royal Infirmary, where he died on the following day. The jury returned a verdict of "Accidental death."

WAKEFIELD WATER-WORKS COMPANY.—The half-yearly meeting of the company was held on the 21st ult. In consequence of the very serious illness of Mr. W. Statter, the chairman of the company, Mr. W. Stewart, the vice-chairman, presided. The directors report was as follows:—"In presenting the balance-sheet and report for the half year ending June 30, 1874, the directors have pleasure in reporting to the shareholders that they are in a position to recommend the payment of the usual dividend, at the rate of 9 per cent. per annum on the paid-up capital, and also the authorized dividend at the rate of 5 per cent. per annum upon the £10 shares, clear of income-tax, and also to carry a surplus of £34 9s. 11d. to the reserve-fund, which fund now amounts to £1806 13s. 4d. Your directors regret that the application of the company to Parliament for a bill for a fresh supply of water from Langsett, although successful in the Commons, was, after an arduous contest, rejected by the Lords. They have under careful consideration what steps shall now be taken by the company for the improvement of the water until a new source of supply has been secured. The revenue account showed that the half year's water-rents, due from December 25, 1873, to June 30, 1874, were £4540 1s. 2d. The working expenses were £488 5s. 4d.; directors stipend and auditors fees, £56 6s.; wages, £440 11s.; rent and taxes, £202 0s. 1d.; interest, £45 11s. 11d. The sum of £130 had been repaid from the reserve-fund to the West Riding Asylum, as abatement for overcharges for water. The total expenses were £1232 14s. 4d. The balance of profit for the half year was £3313 9s. 11d., and as there was a balance from last half year's account of £1902 3s. 5d., the amount available for dividend was £5215 13s. 4d. The dividend on the paid-up capital of £68,700, at 9 per cent., was £3091 10s.; and on £10 shares, at 5 per cent., £187 10s.; after paying which, and the £130 to the asylum, there was a balance of reserved fund of £1806 13s. 4d. The expenses on capital account during the last half year were stated to be as follows:—Mains and laying, £318 12s. 2d.; meters and sluices, £21 4s.; parliamentary expenses, £8517 14s. 9d." The report and balance-sheet were unanimously adopted, on the motion of the chairman, seconded by Mr. John Connor, one of the directors. Alderman Watson alluded to the state of the accounts, and expressed it as his opinion that the charges of the directors for their attendance before the committee of the House of Lords were exorbitant and extortionate. The charges varied from £2 2s. to £5 5s. per day. The alderman also complained that an old engine, disposed of by the directors in 1871, had not been paid for by the purchasers. It was explained that there was a running account between the company and the firm who bought the engine. Mr. W. W. Wiseman, of Ossett, proposed a vote of thanks to the chairman, which was seconded and carried.

COAL-FIELDS OF RUSSIA.—In a paper read before the Institute of Mining Engineers at Cardiff, Mr. J. B. Simpson, of Blaydon-on-Tyne, made the following remarks, which are based upon information and statistics collected by him during a recent visit to Russia:—As far back as 1848 a geological survey of Russia was made under the auspices of the Government, and since then more complete investigation of the different districts had been made. From the geological map it was seen that the carboniferous limestone formation has a very extensive range. Thin bands of it appear to flank both sides of the Ural Mountains, and they occur again over an extensive area in the Donetz district near the Black Sea. The coal-field of Russia was divided into three districts—the Tula coal-field, extending over an area of 13,000 square miles, at present but little worked, only sending up about 140,000 tons of coals per annum. This was to some extent owing to the great distance of the railway, but a new railroad was being laid down to reach this coal-field, which included two seams of coal, respectively 3 feet and 7 feet in thickness. The next field in point of extent was that known as the Demity, situated in the country of the Don Cossacks, on the shores of the Sea of Azoff. That field was 11,000 square miles in extent, and embraced a vast thickness of coal, many of the seams being brought within easy reach from the surface through the dislocation of the rocks of the country. It was both bituminous and anthracite in quality, and the same seams were found bituminous in one place, while they were anthracite in another—in that respect, as Sir R. Murchison had pointed out, resembling in a remarkable manner the analogous special feature of the South Wales coal-field. In this district 60 seams had been discovered, of which it is believed 44, having an aggregate thickness of 114 feet, were workable. The chief seams were 3 feet, 2 feet 7 inches, and 5 feet 7 inches in thickness, and the average depth of the pits was from 50 to 80 yards. The per centage of carbon was 89. Coal 30 inches in thickness had been found at 36 fathoms from the surface, and 36 inches at 48 fathoms. In the Ural district there was a long narrow coal-field at the base of that range of mountains in which seams of coal 30 and 40 feet thick were found and worked. It was of a soft and friable nature, but threw out a great heat. The peculiarity of all these coal-fields was that they belonged to a distinct formation altogether from the true carboniferous series; and the only coal-field of Russia which belongs to the true coal formation was a small tract of some 80 square miles in Poland, which contained seams varying in thickness from 3 feet 8 inches to 21 feet, this last being a magnificent vein of coal, without the slightest clod between it. There was 60 feet of workable coal in the centre of this district; but there was a marked absence of some of the rocks invariably present in the English coal-field, and the coal there rested upon the Devonian. Of the total quantity of 817,000 tons of coal worked in Russia in 1872, one-third was wrought in this small Polish basin. The Donetz coal-fields extend about 11,000 square miles, and the Ural coal-fields 10,000 square miles. The quantity of coals raised in Russia in 1871 was 817,008 tons, being double that of 1868. The quantity of coals imported into Russia from England in 1855 was 213,553 tons; the quantity in 1871 was 872,588 tons. In 1872 Russia exported 4400 tons of coal. The quality of the Russian coal-field varied very much; but in the Donetz coal-field it was of a very superior quality. In some parts of Russia, for locomotives and for factories, coal was being used now, but at present, wherever wood can be obtained, which cost the same money, it was preferred; but as the wood diminished, the coal would become more and more used. There were now 8500 miles of railway opened—1000 sanctioned by the Government, and many more projected; and the necessities of locomotion alone would lead to a more rapid and extensive development of their coal-fields than the Russians had hitherto shown.

Notes and Queries.

Naphthaline asks: "Can any of the JOURNAL readers give me a cure for the stoppage of consumers fittings? The services and mains are very seldom choked. We have spent a considerable sum in having a main run from the hydraulic main round the retort-house, erected a scrubber and large purifiers, and the nuisance is as bad as ever."

Share List,
OF
Metropolitan Gas and Water Companies.

(*Corrected by Mr. F. N. GOLDING, Sun Court, Cornhill, from the latest Stock Exchange Quotations.*)

Number of Shares issued.	Amount per Share.	NAME.	Amount paid up p. Share.	Dividend p. Cent. p. Annum.	Latest Quotations.
	£	GAS COMPANIES.	£ s. d.	£ s. d.	£
8000	20	Anglo-Romano	20 0 0	10 0 0	14 — 16
5000	20	Bahia (Limited)	20 0 0	3 0 0	10 — 11
1000	20	Do., preference	20 0 0	10 0 0	25 — 27
1000	20	Do., do., redeemable	20 0 0	10 0 0	20 — 22
1500	20	Do., perpetual preference	20 0 0	7 10 0	20 — 22
40000	5	Bombay (Limited)	5 0 0	6 15 0	6¼ — 6⅝
10000	5	Do., fourth issue	4 0 0	6 15 0	1—1⅛ pm.
10000	20	British (Limited) (Norwich, Hull-Soulcoates, Hanley, Tunstall & Shelton [Potteries], Trowbridge., and Holywell.)	20 0 0	10 0 0	34 — 36
7500	20	Cagliari (Limited)	20 0 0	7 0 0	14 — 16
180000	10	*Chartered* A ordinary	10 0 0	10 0 0	15⅞— 16⅛
25000	10	Do. A, 5 per cent. preference	10 0 0	5 0 0	15 — 15½
20000	10	Do. A, 5 per cent. do., 2nd issue	10 0 0	5 0 0	15 — 15⅝
30000	10	Do. A, 5 per cent. do., 3rd issue	10 0 0	5 0 0	4¼—4⅜ pm.
10000	10	Do. B, 4 per cent. maximum	10 0 0	4 0 0	7 — 7½
20000	10	Do. C, 10 per cent. preference	10 0 0	10 0 0	20½— 21½
12000	25	Do. D, 10 per cent. preference	25 0 0	10 0 0	51 — 53
4438750*l.*	Sk.	*Commercial*	100 0 0	10 0 0	171 —174
20000	20	Continental Union	20 0 0	8 0 0	18¼— 19½
20000	20	Do., new	12 10 0	8 0 0	1½—½ dis.
10000	20	Do., preference (Grmny.: Strsbg. France: Cette, Nismes, Montargis Vienne, Roanne, Beaucaire, Rueil, Albi. Italy: Milan, Genoa, Parma, Modena, Alessandria, Messina.)	20 0 0	7 0 0	24 — 26
5000	10	*Crystal Palace District*	10 0 0	10 0 0	16 — 16½
5000	10	Do., preference	10 0 0	6 0 0	11¼— 12¼
10000	10	Do., ordinary	10 0 0	7 0 0	12½— 13½
2500	10	Do., converted	2 0 0	10 0 0	1½— 2 pm.
2500	10	Do., converted	2 0 0	7 0 0	1 —1½ pm.
23406	10	European (Limited)	10 0 0	10 0 0	14 — 15
12000	10	Do., new shares	7 10 0	10 0 0	2¼—2⅝ pm.
	10	Do., new shares (Boulogne, Amiens, Rouen, Caen, Havre, & Nantes.)	5 0 0	10 0 0	½—2 pm.
4054	10	Foreign and Colonial (Limited)	10 0 0	..	9 — 10
5300	10	Hong Kong (Limited)	10 0 0	10 0 0	14 — 15
1560000	100	*Imperial*	100 0 0	10 0 0	170 —173
78000	12½	Do., new shares	12 10 0	7 0 0	15⅞—16¼ xd
1300	100	Do., bonds	£100	10 0 0	197 —200
56000	50	*Imperial Continental* (Amsterdam, Berlin, Ghent, Hanover, Lille, Rotterdam., Aix-la-Chapelle, Antwerp, Bordeaux, Brussels, Frankfort-on-Maine, Haarlem, Stolberg, and Vienna.)	43 15 0	9 2 6	58 — 60
3000	40	*Independent*	40 0 0	10 0 0	65 — 67
3000	10	Do.	10 0 0	5 0 0	8¼— 9¼
3000	20	Do.	20 0 0	7 10 0	25 — 26
4500	10	Do., D	3 0 0	10 0 0	3 — 4 pm.
3783501.	Sk.	*London*	100 0 0	10 0 0	170 —172
1500001.	Sk.	Do., 1st preference	100 0 0	6 0 0	118 —121
14450	Sk.	Do., 2nd preference	100 0 0	6 0 0	
4350	Sk.	Do., 3rd preference	100 0 0	6 0 0	
7622	25	Do., A shares	12 10 0	6 0 0	
268051.	All	Do., Debenture stock	100 0 0	5*l.* & 6*l.*	
15000	5	Malta and Mediterranean (Limited)	5 0 0	3 0 0	2 — 2⅛
6000	5	Do., preference	5 0 0	7 0 0	5 — 5⅛
20000	5	Mauritius (Limited)	2 0 0	7 0 0	2 — 2⅛
25000	20	Monte Video (Limited)	20 0 0	..	21¼— 22½
8000	10	Nietheroy, Brazil (Limited)	10 0 0	..	
30000	5	Oriental (Calcutta)	5 0 0	9 0 0	7 — 7¼
30000	5	Do., new shares	2 10 0	9 0 0	⅜—1¼ pm.
10000	5	Ottoman (Limited)	5 0 0	nil.	2 — 2½
17500	10	Pará (Limited)	10 0 0	7 0 0	6 — 8
27000	20	*Phœnix*	20 0 0	10 0 0	34 — 36
5600001.	100	Do., new	55 0 0	7 10 0	71 — 73
1440001.	Sk.	Do.	100 0 0	5 0 0	93 — 95
5000	20	*Ratcliff*	20 0 0	10 0 0	34 — 36
36000	20	Rio de Janeiro (Limited)	20 0 0	10 0 0	30 — 31
7359	5	Singapore (Limited)	5 0 0	7 10 0	4½— 5
2000	5	Do., preference	5 0 0	7 10 0	5½— 6
1500	32½	Shanghai	32 10 0	12 0 0	30 — 32
4000	50	*South Metropolitan*	50 0 0	10 0 0	86 — 88
4000	12½	Do.	12 10 0	10 0 0	21 — 21½
20000	12½	Do., new shares	5 0 0	10 0 0	6¼— 6⅞ pm.
15000	10	*Surrey Consumers*	10 0 0	10 0 0	16½— 17
10000	10	Do., new	7 0 0	10 0 0	5 — 6 pm.
9000	4	United General (Limerick)	4 0 0	2 10 0	2 — 2½
1500	10	*Wandsworth and Putney*	10 0 0	10 0 0	14 — 15
1500	10	Do.	10 0 0	7 10 0	11 — 12
2957	10	Do.	10 0 0	7 0 0	
993	10	Do.	3 0 0	7 0 0	
16000	5	*West Ham*	5 0 0	10 0 0	7⅞— 8
10000	5	Do., new shares	2 10 0	10 0 0	3 — 4
		WATER COMPANIES.			
12000	100	Chelsea	100 0 0	6 0 0	122 —124
1800000	100	East London	100 0 0	6 0 0	124½—125½
8000	50	Grand Junction	50 0 0	7 0 0	76 — 78
5840	25	Do., ½ shares	25 0 0	7 0 0	36½— 37½
2160	25	Do., new do.; maximum dividend, 7½ per cent.	25 0 0	7 0 0	31 — 33
4396	100	Kent	100 0 0	6 10 0	128 —130
5339	100	Lambeth	100 0 0	6 5 0	123 —125
1161	100	Do.	20 0 0	6 5 0	
442	100	New River	100 0 0	8 0 0	170 —180
4475	100	Do.	30 0 0	8 0 0	50 — 55
400000	100	Do., debenture stock, 4 per cent.	100 0 0	4 0 0	97 — 99
3036	100	Southwark and Vauxhall	100 0 0	5 5 0	105 —107
1296	100	Do., preference stock	100 0 0	5 0 0	101 —103
	100	Do., D shares	100 0 0	5 5 0	104 —106
		Do.	..	4 10 0	
	100	Do., new ordinary	..	4 10 0	
1600	100	Do., new ordinary, No. 1	40 0 0	4 10 0	
12172	61	West Middlesex	61 0 0	£6 per sh.	125 —126

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

2878.—Aronson, J. N., Portland Place, London, "Improvements in lamps or lighting apparatus." Aug. 21, 1874.
2880.—Houghton, J., Salford, Lancs, "Improvements in the construction of taps or valves." Aug. 21, 1874.
2894.—Hulett, D., High Holborn, London, "Improvements in street and other lamps or lanterns, and in apparatus for regulating the supply of gas thereto and to other gas-burners." Aug. 24, 1874.
2911.—Lee, W., and Shearer, G., Liverpool, "An improved tube-plug or stopper." Aug. 26, 1874.
2915.—Hill, F. B., Lambeth Road, Southwark, Surrey, "Improvements in connecting apparatus for coupling hose and other pipes, and securing covers on pipes and in other situations." Aug. 26, 1874.
2920.—Ramsden, J. C., Lightcliffe, Halifax, Yorks, "Improvements in apparatus to be employed in the manufacture of gas for heating or illuminating purposes." Aug. 26, 1874.

GRANTS OF PROVISIONAL PROTECTION.

2483.—Henry, M., Fleet Street, London, "Improvements in the method of and apparatus for treating residua of distillation, fermentation, and similar operations in order to obtain and utilize ammonia, carbonic acid, ammoniacal salts, alkaline carbonates, saltpetre, and other products." A communication. July 16, 1874.
2632.—Bowness, W. D., and Judge, J., Bishop Auckland, Durham, "Improvements in apparatus for generating and purifying gas for illuminating and other purposes." July 28, 1874.
2797.—Jones, F. St. J., Worcester, "Improvements in taps and valves for regulating the flow of gas and other fluids." Aug. 13, 1874.
2802.—Henry, M., Fleet Street, London, "Improvements in the method of and apparatus for obtaining ammonia from waste products and other matters." A communication. Aug. 13, 1874.
2815.—Smith, W. H., Edgbaston, Birmingham, "Improvements in treating metals and their alloys by subjecting them to the action of liquids, gases, vapours, and in apparatus employed therein, and for the manufacture of gas for illuminating and heating purposes." Aug. 15, 1874.
2822.—Forbes, Rev. G. H., Broughton, Northampton, "Improvements in the manufacture of cement." Aug. 15, 1874.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION has been AWARDED to

GWYNNE & BEALE'S PATENT IMPROVED GAS-EXHAUSTERS,

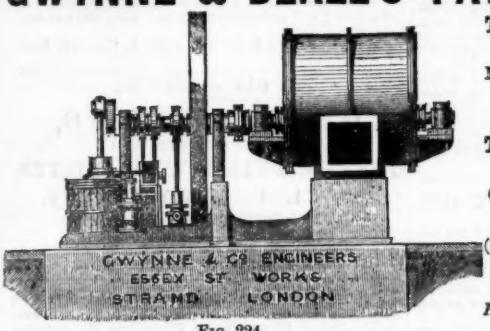


FIG. 224.

The BEST EXHAUSTERS IN THE WORLD.
Made under the personal superintendence of
Mr. BEALE,
The oldest Maker, Inventor and Patentee of
GAS-EXHAUSTING MACHINERY.
(It is NOT CORRECT to state that Mr. BEALE has RETIRED.)

Prices and every information on application.

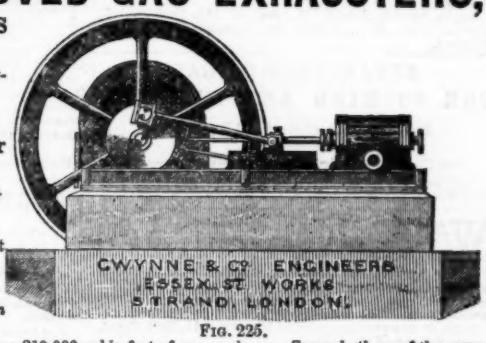


FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. Gwynne and Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,
CAN BE HAD ON APPLICATION TO
GWYNNE & CO., HYDRAULIC & GAS ENGINEERS, ESSEX STREET WORKS, STRAND, LONDON, W.C.
G. & Co. are now manufacturing for a London Gas Company three of their 210,000 cubic feet Patent Gas Exhausters, and many of all sizes.

EDWARD E. CROMBIE & CO.,

(Successors to N. DEFRIES & CO.,)

DIANA PLACE, EUSTON ROAD, LONDON,

MANUFACTURERS OF

PATENT DRY TWO AND THREE DIAPHRAGM GAS-METERS,

UPHELD FOR FIVE YEARS FREE OF CHARGE.

PRIZE MEDALS—LONDON, 1851, AND PARIS, 1867.

CAFFALL, THOMAS, & CO., LIMITED.

PATENT IMPROVED SEAL
FOR
GAS HYDRAULIC MAINS.

SAVES COAL, RETORTS, FUEL, LABOUR, TIME, SPACE, AND CAPITAL.

PREVENTS STOPPAGE OF ASCENSION-PIPES, DEPOSITION OF CARBON IN RETORTS, THICKENING OF TAR IN HYDRAULIC MAIN.

GIVES MORE GAS PER TON OF COAL, WITH HIGHER ILLUMINATING POWER, SATISFACTION, AND PROFIT TO SHAREHOLDERS AND MANAGERS.

IS STRONG, SIMPLE, EASILY FIXED AND WORKED, AND THOROUGHLY EFFICIENT AT ALL TIMES.

TESTIMONIAL.

Alton Gas and Coke Company, Alton, Hants, April 25, 1874.

Gentlemen,—In reply to your inquiry respecting your Patent Dip for Hydraulic Gas-Mains in use at these works, I beg to say that, upon looking into our carbonizing account for the last 12 weeks, and comparing the result with the same quarters of the past five years, I find that your Dip has given our Company an increase of 1286 feet of gas per ton of coals beyond the makes in the other years, notwithstanding the retorts have been in use for three years.

I may say that our Company are so satisfied with the Dips that it is intended to fit up the other retorts with them this summer.

I am, gentlemen, your obedient servant,
Messrs. Caffall, Thomas, and Co., Limited, 28, Gracechurch Street, E.C. Wm. Trimming, Secretary.

Models may be seen, and information obtained, at the Offices, 28, Gracechurch Street.

WANTED, a thoroughly competent and practical man as GENERAL MANAGER for the Milnrow gas Company, near Rochdale.

Tenders to be addressed to the CHAIRMAN of the Company, on or before the 11th day of September next, endorsed "Tender of Manager."

WANTED, by the son of a Gas Manager, a situation as METER INSPECTOR, Fitter, Main and Service Layer, or Manager of a small Works. Security given.

Address C. W. KITTO, Gas-Works, Tonbridge, KENT.

WANTED, for a provincial Gas-Works, near London, a BLACKSMITH.

Applications, with references, to be addressed to X. Y., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS ENGINEERS AND MANAGERS.

THE Cheapest House in the Trade for WOOD GRIDS, made by Steam Machinery.

Prices on application to E. J. JONES, Turk's Head Court, Golden Lane, LONDON, E.C.

WANTED, a Manager, who writes and speaks Italian, to TAKE CHARGE of Gas-Works in Italy.

Apply, by letter, to L. Q., care of Mr. Deakin, 107, LONDON WALL, E.C., stating age, experience, and salary required.

ADVANTAGES OF GAS FOR COOKING AND HEATING,

BY

MAGNUS OHREN, A.I.C.E., F.C.S.

For Companies to issue to their gas consumers.

Specimen Copy by post 4d., direct from MAGNUS OHREN, Gas-Works Lower Sydenham, London, S.E.

WANTED, by an experienced Gas Engineer, the MANAGEMENT of medium-sized works, or the working part on a lease. At home or abroad. Payment by results. Practically acquainted with manufacture of secondary products; or as Superintendent in a large works making over 100 millions annually. Testimonials, references, and security given.

Address ANTHRACENE, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS COMPANIES.

THE Advertiser (a Gas Manager who will shortly be disengaged) is desirous of a re-engagement as MANAGER, or Manager and Secretary. Has had 20 years practical experience, home and foreign, and is thoroughly acquainted with the most modern and approved appliances introduced in the manufacture, purification, and distribution of gas. Aged 36. Active and energetic. Satisfactory references, &c. Would not object to go abroad for an English Company.

Address D., care of Mr. Batley, 13A, Great George Street, WESTMINSTER.

CANNEL.

THE West Yorkshire Iron and Coal Company, Limited, will be glad to receive FORMS for TENDERS from Gas Companies and others requiring a supply of CANNEL.

Address, 72, Wellington Street, LEEDS.

BOROUGH OF BARROW-IN-FURNESS.

TENDERS FOR GAS COALS.

THE Gas and Water Committee invite TENDERS for the supply of about 2000 tons of CANNEL and 6000 tons of best GAS COAL to be delivered at their works in such quantities and at such stated periods as may be required during the twelve months ending Dec. 31, 1875.

Further particulars may be obtained on application to Mr. John Lewis, Manager.

Sealed tenders, addressed "The Chairman of the Gas and Water Committee," and endorsed "Contract for Gas Coals," to be sent to me not later than Sept. 2, 1874.

C. F. PRESTON, Town-Clerk.

Municipal Offices, Aug. 21, 1874.

TO WATER-WORKS CONTRACTORS.

THE Weardale and Shildon District Water-Works Company invite TENDERS from competent parties to undertake the entire construction of Two SERVICE RESERVOIRS; one situate near North Beechburn, about two miles from Bishop Auckland, which is to contain 3 million gallons; the other situate on land adjoining Wood Lane, about half a mile from Ferryhill Village, which is to contain 2 million gallons of water.

Plans and specifications can be seen, and lists of quantities obtained, at the Office of the Engineer, Mr. William Bouch, North Road, Darlington.

Tenders to be forwarded to me, on or before Saturday, the 12th day of September.

The Company do not bind themselves to accept the lowest or any tender.

WILLIAM HARDING, Secretary.

Russel Street Buildings, Darlington, Aug. 26, 1874.

TO COKE CONTRACTORS AND OTHERS.

THE Directors of The Gaslight and Coke Company are prepared to receive TENDERS for the purchase of the whole or any portion of the COKE which will be manufactured at their works, at Beckton, on the River Thames, near Barking Creek, for One year from the 1st of October next.

Tenders should state the price per chaldron of 36 bushels for delivery free on board barges alongside the Company's Wharf at Beckton, or into trucks on the Company's line of railway, which communicates with the Great Eastern Railway near North Woolwich.

Contractors will be required to enter into a bond with sureties for the due performance of their contract. Payments monthly in cash.

Further information, if desired, may be obtained at this Office on application to the undersigned, to whom sealed tenders, marked "Tender for Coke," should be sent on or before Thursday, the 17th proximo.

By order,

JOHN ORWELL PHILLIPS, Secretary.

N.B.—The Directors do not bind themselves to accept the highest or any tender, and reserve to themselves the right of accepting the whole or any portion of any one tender.

Horseferry Road, Westminster, Aug. 24, 1874.

TO COKE CONTRACTORS AND OTHERS.

THE Directors of The Gaslight and Coke Company are prepared to receive OFFERS from parties willing to undertake the SALE, on commission, of COKE, manufactured at their works, at Beckton, for One year from the 1st of October next.

Further information, if desired, may be obtained at this Office on application to the undersigned, to whom sealed tenders, marked "Sale of Coke on Commission," containing reference to a London banker, should be sent, on or before Thursday, the 17th proximo. By order,

JOHN ORWELL PHILLIPS, Secretary.

Horseferry Road, Westminster, Aug. 24, 1874.

CRYSTAL PALACE DISTRICT GAS COMPANY.

NOTICE is hereby given that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the London Tavern, Bishopsgate Street, London, on THURSDAY, the 24th of September, to receive the Report of the Directors, the Balance-Sheet confirmed by the Auditors, to declare a Dividend, and for general business.

The Chair will be taken at half-past Two o'clock precisely. By order of the Board,

MAGNUS OHREN, Secretary.

Lower Sydenham, S.E., Aug. 29, 1874.

COMMERCIAL GAS COMPANY.—NOTICE is hereby given that the next ORDINARY MEETING of the Company will be held at the London Tavern, Bishopsgate Street, in the City of London, on FRIDAY, the 2nd day of October next, at Twelve o'clock at noon, to receive the Report of the Directors, and to declare a Dividend to the 30th day of June last.

The Books of the Company will be closed for the Transfer of Stock from the 16th of September until the 2nd of October now next ensuing.

By the Company's Act of Incorporation, the holders of Stock can inspect the Books of the Company during one fortnight before and one month after the Meeting.

By order of the Board,

GEORGE JAQUES, Secretary.

Stepney, Aug. 28, 1874.

ST. JOHN, PORTO RICO.

CONTRACT FOR GAS.

ON the 1st of November next the service of PUBLIC GAS LIGHTING the above city will be adjudged by competition in the Municipal Chambers of that city, subject to the schedules of conditions, which are now lying for the inspection of those interested, at the respective Consular Offices of Spain, in London, New York, and Paris.

J. M. DE SATRUSTEGUI, Consul-General of Spain.

21, Billiter Street, E.C., London, Aug. 28, 1874.

GAS COMPANIES' ACCOUNTS.

EDWARD SANDELL,

PUBLIC ACCOUNTANT,

The Projector of the Gas Companies Analyzed Expenditure Account Book, having had twenty years' experience in opening, keeping, auditing, and investigating Gas Companies Accounts, offers his services for similar purposes, and also in preparing Financial and Statistical Accounts for Arbitrations or Parliamentary Applications. References to numerous Gas Companies and the most eminent Consulting Gas Engineers.

4, Skinner's Place, Queen Victoria Street, LONDON.

THE Advertiser is desirous of Contract-ING for the erection of Gas and Water Works, Roofs, Tanks, &c., at home or abroad. He can give unexceptionable references as to experience and ability, and is prepared with security for the due performance of any contract he may undertake. Has been a number of years abroad engaged at both erecting and managing Gas and Water Works.

Address SUBCONTRACTOR, 3, Broadway, London Fields, HACKNEY.

WATER-MAINS.

COTTERILL'S PATENT STEEL TUBE-DRILLS, for connecting services to water-mains, *under pressure*, without turning off the water. They drill and tap themselves, and are left in the mains. Made of all sizes, from ¾ to 2 inches and upwards. They cost less than the ordinary plan.

Apply to CHARLES FORSTER COTTERILL, Cannock, STAFFORD, Patentee.

TO GAS COMPANIES.

GEORGE McKAIG,

MANUFACTURER OF

GAS-PURIFYING WOOD SIEVES,

153, CLEVELAND STREET,

DONCASTER.

It requires but one trial to prove the Superior Make, Strength, and Durability of these Sieves.

BAILEY'S Patented Inventions are now in extensive use wherever steam is known. Bailey's Patent Steam Gauges, Pyrometers, Water Gauge Cocks, Test Pumps, Fusible Plugs, Steam and Water Valves, Safety Valves, Junction Valves, Pumps, Tell-Tales, Recorders, Lightning Conductors, Electric Telegraphs, Turret Clocks, Steam Joint Cement, Lifting Jacks, Boiler Feeders, Lime Catcher and Separator, Injectors and Ejectors, and every description of first-class Brass Work for Engines and Boilers. Gas-Works Managers who have not our large book should send for it.

16th edition, 1000 engravings, 4to., post free 2s. in stamps, weight 10 oz., cost of production £1000,

BAILEY'S Illustrated Inventions, containing details and prices of goods in our five several departments:—(1) Brass Foundry, Steam Gauges, Indicators, Feeders, and Fittings; (2) Engineers Sundries, Small Tools, and Stores; (3) Machine Pump and Fire Engine; (4) Turret Clock, &c.; (5) Electric Telegraph, A B Instruments, Bells, and Apparatus.

J. BAILEY and Co., Albion Works, Salford, LANCASHIRE.

TO GAS COMPANIES, ENGINEERS, MANAGERS, &c.

DESIGNS & PLANS of GAS-WORKS,

EXTENSIONS AND ALTERATIONS,

DRAWINGS AND TRACINGS OF GASHOLDERS

TANKS, RETORTS, RETORT-HOUSE FITTINGS, ROOFS, GIRDERS, CONDENSERS, SCRUBBERS, ENGINES, BOILERS, EXHAUSTERS, PURIFIERS, GOVERNORS, VALVES, &c.,

Prepared with despatch, and at a moderate rate.

HILL AND CO.,

23, Southampton Buildings, Chancery Lane, W.C.

GEORGE ORME & CO.,

GAS METER MANUFACTURERS, BRASSFOUNDERS & FINISHERS,

ATLAS METER-WORKS, OLDHAM.

CONSUMERS WET & DRY GAS-METERS ON THE MOST APPROVED PRINCIPLES.

STATION-METERS, GOVERNORS, PRESSURE-REGISTERS,

And every Description of Gas Apparatus.

GAS, STEAM, AND WATER FITTINGS.

JAMES GREGORY AND SONS,

MANUFACTURERS OF EVERY DESCRIPTION OF

Corporate Mark
SOHO
Granted 1763.

STEEL TOOLS FOR GAS & WATER WORKS.

All-Steel Charging and Stoking Shovels, Coke Screens and Forks, Steel Scoops, Picks, Mattocks, Axes, Trowels, &c.

WELDING STEEL RAKE AND SPUD HEADS.

SUPERIOR CAST-STEEL FILES and SAWS; Solid Cast-Steel Hand and Sledge Hammers.

BEST CAST STEEL for making Chisels, Turning Tools, Taps and Dies, Drills, Snaps, &c.

SINGLE AND DOUBLE SHEAR, Spring, Sheet, and Blister Steel.

SILVER STEEL for Rod-Chisels and Diamond-Points for Cutting Cast-Iron Pipes, and for other work requiring a Special Quality and Temper, and every other description of Steel and Tools as supplied to the largest London Gas Companies, Contractors, and Engineers.

SOHO STEEL-WORKS. SHEFFIELD, & 2, GRESHAM BUILDINGS, BASINGHALL ST., LONDON. E.C.

ALFRED WILLIAMS,
PHŒNIX FIRE-BRICK WHARF,
64, BANKSIDE, SOUTHWARK, LONDON, S.E.

GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS,
AND FOR THE
SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,
AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.

F. & C. OSLER,
45, OXFORD STREET, LONDON, W.
MANUFACTORY AND SHOW-ROOMS:
BROAD STREET. BIRMINGHAM.
ESTABLISHED 1807.
MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,
WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.
TABLE GLASS OF ALL KINDS.
CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

SPENCE BROS. CHEMICAL COMPANY, LIMITED,
MANUFACTURERS OF
SULPHATE OF AMMONIA, VITRIOL, PATENT DRY COPPERAS, &c.
PURCHASERS OF
SPENT OXIDE AND AMMONIACAL LIQUOR;
AND CONTRACTORS FOR THE
PURIFICATION OF COAL GAS.
ALL COMMUNICATIONS TO
VICTORIA CHEMICAL WORKS, BRADFORD, MANCHESTER.

THE PATENT
"UNIVERSAL" STEAM PUMP
WAS AWARDED, AT THE
VIENNA EXHIBITION, 1873,
THE GRAND PRIZE "MEDAL OF PROGRESS."

OPINIONS
OF
THE PRESS.

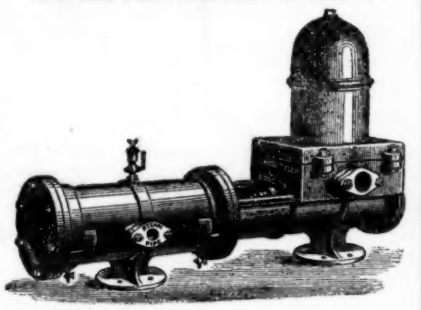
"The simplest machine of its kind."—*Engineering.*

"Remarkable for its simplicity and ease of action."—*Daily Telegraph.*

"None that we have noticed work so quietly."—*The Engineer.*

"Nothing invented in hydraulic steam power half so cheap and effectual."—*Griffith's Iron Trade Exchange.*

NO TAPPET VALVES OR GEAR.



IN USE IN SOME OF
THE PRINCIPAL GAS-WORKS IN LONDON, SHEFFIELD, PENISTONE, &c.,
FOR
TAR AND AMMONIACAL LIQUORS.

One selected from amongst many Testimonials received by H. T. & Co.:—

"*Ardwick Bridge Chemical Works, Manchester, Oct.* 28, 1872.

"Sir,—The 'Universal' Steam Pump obtained from you, and which has been employed during the last six months pumping caustic soda at these works, still continues working satisfactorily. "Yours truly,

(Signed) "PETER HART, *Manager.*"

SOLE MAKERS,
HAYWARD TYLER AND CO.,
84 and 85, UPPER WHITECROSS STREET,
LONDON, E.C.

HOPKINS, GILKES, & CO.,
LIMITED,
MIDDLESBOROUGH,
SUPPLY GAS & WATER PIPES of EVERY SIZE.
Plain, Turned and Bored, and Coated.
CAST-IRON RETORTS.
Castings for Gas-Works of every description.
EXHAUSTERS.
LONDON OFFICE: 25, LAURENCE POUNTNEY LANE.

BELGIAN CLAY RETORTS.
J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.
Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

FIRE-CLAY RETORTS.
WILLIAM FRASER,
INVERKEITHING,
(Owner of the Works at which Fire-Clay Retorts were first made), can supply
RETORTS, FIRE-BRICKS, &c.,
to any extent.
References can be given to managers of above a hundred Gas-Works whom he supplies.
He ships at Charlestown his
CELEBRATED HALBEATH STEAM COALS,
on Navy List.

JAMES NEWTON & SONS,
(Established 1820,)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.,
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for
GAS AND WATER WORKS.

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THE ORIGINAL MANUFACTURER OF
WOOD SIEVES
FOR
GAS PURIFIERS & SCRUBBERS.
WORKS:
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DEMPSTER'S
RENOWNED
WOOD SIEVES,
WITH TAPER BARS,
MADE BY MACHINERY
CAPABLE OF MAKING 10,000 FEET WEEKLY.
References to Hundreds of First-Class Engineers.
ROSE MOUNT IRON-WORKS
ELLAND, NEAR HALIFAX.

THE PATENT
CATOPTRIC LAMP
Is now in use in Moorgate Street, Cheapside, and Trafalgar Square, and has been in successful operation upon Waterloo Bridge since Oct. 7, 1871.
T. A. SKELTON, 37, Essex St., Strand, LONDON,
INVENTOR AND PATENTEE.

GAS COMPANIES
AND
LOCAL BOARDS
Requiring New Street-Lamps are recommended
A **KEEN'S PATENT**
DOUBLE-CLIP
STREET-LAMP.
A great improvement on the old-fashioned 14-in. Lamps.
They have been sold to various Gas-Works throughout the country and abroad, and the highest satisfactory testimonials are given as to their superiority.
For particulars of price, &c., apply to
WILLIAM KEEN, Sole Proprietor and Manufacturer, Robertson Street, HASTINGS.

THOMAS ALLAN & SONS, of Springbank Iron-Works, Glasgow, manufacture small cast-iron GAS AND WATER PIPES, 1½ to 6 inches, at their branch works, Stockton-on-Tees, and have at present a large stock, which they are open to sell at moderate prices

RICHARD THOMAS & CO.,
40, GRACECHURCH STREET,
Manufacturers of
EWELL FIRE-BRICKS, CLAY, AND CEMENT.
Warranted the best quality.
WORKS AT EPSOM.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of
CLAY RETORTS, FIRE-BRICKS, AND EVERY DESCRIPTION OF FIRE-CLAY GOODS

THOMAS LAMBERT & SONS
MANUFACTURE EVERY DESCRIPTION OF
GAS AND WATER FITTINGS;
ALSO,
WROUGHT-IRON TUBES & FITTINGS.
SHORT STREET, LAMBETH, LONDON.

INTERNATIONAL EXHIBITION, 1862.
CLASS X.
PRIZE MEDAL
For excellence of Fire-Clay Gas Retorts, and
"HONOURABLE MENTION" for
good quality of Fire-Bricks.
WILLIAM STEPHENSON & SONS,
THROCKLEY,
NEWCASTLE-ON-TYNE.

HARRIS AND PEARSON,
STOURBRIDGE,
Proprietors of
BEST GLASS-HOUSE POT AND CRUCIBLE CLAY;
Manufacturers of
FIRE-BRICKS, GAS-RETORTS, & FIRE-CLAY GOODS
of every description.
Orders of any magnitude, for home and exportation, executed with all possible despatch.
N.B.—A quantity of Retorts in stock. Circulars, 15 in. and 16 in. Ovals, 20 in. by 14 in. D's, 15 in. by 13 in.; 16 in. by 12 in.; 18 in. by 14 in. 20 in. by 16 in.; 21 in. by 14 in.; and 24 in. by 14 in.

BOUCK & CO., LIMITED,
MANUFACTURING CHEMISTS,
TAR AND AMMONIA DISTILLERS, &c.,
MILES PLATTING, MANCHESTER.
WM. LITCHFIELD, SECRETARY.

CONTRACTORS for the PURCHASE of GAS TAR AND AMMONIACAL LIQUOR,
Also of their products.

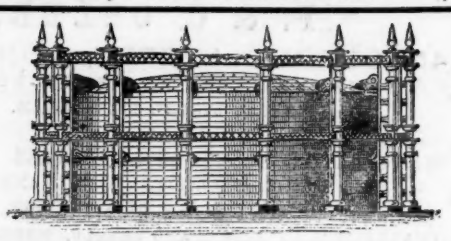
HUTCHINSON BROTHERS,
ALBERT WORKS,
CHURCH STREET, BARNSLEY,
GAS ENGINEERS AND GENERAL COLLIERY FURNISHERS.
Plans, specifications, and estimates supplied, and contracts taken to furnish and erect Gas-Works complete, for supplying Manufactories, Collieries, Mansions, Halls, Railways, and other works.
Competent workmen sent out to town or country.
Agents for the supply of the best qualities of South Yorkshire House and Gas Coal. Prices and particulars on application.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE
FIRE CLAY & BRICK WORKS,
STOURBRIDGE.
Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICK.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.
Successors to
G. BAKER AND CO. LATE BRIERLEY HILL, STAFFORDSHIRE.

CLOTH GAS-BAGS FOR MAINS,

As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather India-Rubber and Gutta-Percha Machine-Bands, Sheet and Washers and Steam Joints.
T. BUGDEN, Manufacturer,
79, GOSWELL ROAD, LONDON, E.C.

THE THAMES BANK IRON COMPANY,
(Successors to LYNCH WHITE,)
SUPPLY FROM STOCK
CAST-IRON RETORTS, SOCKET-PIPES for GAS or WATER PURPOSES, FLANGE-PIPES for STEAM, RAIN-WATER PIPES and GUTTERS, HOT-WATER PIPES and BOILERS, and all requisite Connexions for same; also LAMP-COLUMNS, LAMPS, WROUGHT FRAMES, WROUGHT-IRON TUBING, &c., &c.
All kinds of Gas-Works Apparatus and General Castings made to Pattern or Drawing.
ADDRESS—
OLD BARGE WHARF, UPPER GROUND STREET, LONDON, S.E.

HOPE IRON WORKS,

STOCKTON ON TEES.

ASHMORE & WHILE,
GAS ENGINEERS & CONTRACTORS,
MANUFACTURERS OF GASHOLDERS,
GAS APPARATUS OF EVERY DESCRIPTION,
Including Improved
Retort-Lids, Boilers, Cast and Wrought Iron Tanks, Iron Roofing, Bridges, Girders,
And GENERAL IRONWORK.
N.B—Estimates for all Gas Plant and Remodelling supplied on application.

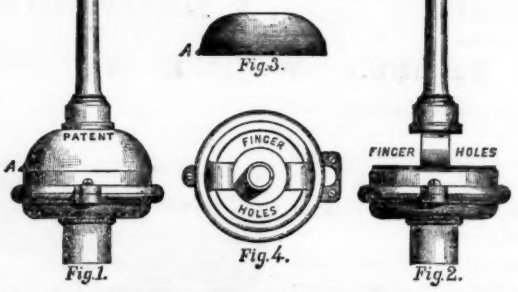
D. BRUCE PEEBLES & CO.'S
PATENT
LAMP REGULATOR


Fig.3.
Fig.1.
Fig.4.
Fig.2.
D. BRUCE PEEBLES AND CO.,
ENGINEERS, WET AND DRY GAS-METER MANUFACTURERS,
PATENTEES OF
GAS REGULATORS FOR PUBLIC LAMPS, FACTORIES, PUBLIC HALLS, AND DWELLING-HOUSES.

Attention is respectfully requested to the following extract from a lecture "On the Economical Combustion of Coal Gas," delivered to the Philosophical Society of Glasgow, by Dr. W. Wallace, F.R.S.E., F.C.S., Gas Examiner for the city of Glasgow, on the 4th of March last:—
"A few years ago, a simple form of Gas Regulator for Street Lamps was introduced, I do not know by whom, and various forms of it, and improvements on it, have been made by many practical gas engineers. Of all the modifications of the instrument, the best in my opinion is that of Mr. D. Bruce Peebles, of Edinburgh; in fact, his Lamp Regulators are so superior that they are likely to supplant all others. Already about 9000 of these have been applied to the street-lamps in Glasgow, and I understand it is the intention of the authorities to introduce them all over the town. The saving thereby effected I calculate to be about £6000 per annum, without any diminution of light. One of the great advantages of Mr. Peebles's apparatus over all others is that it can be regulated while the gas is burning."
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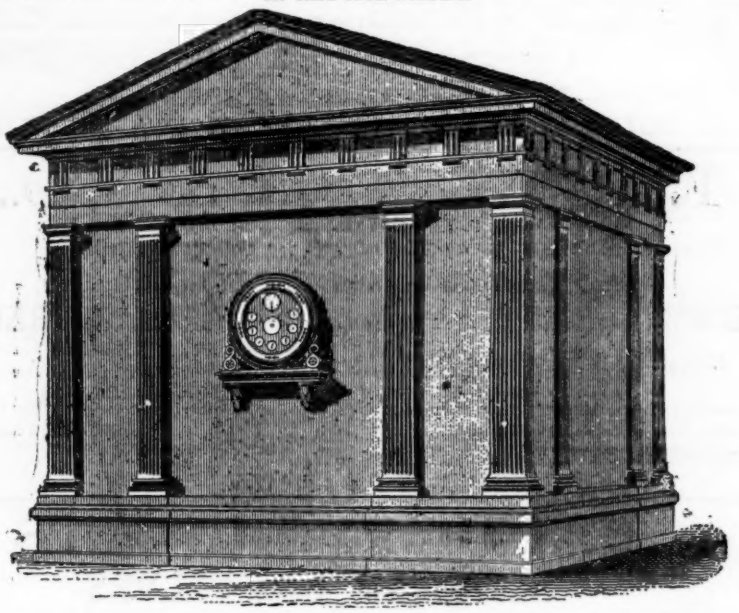

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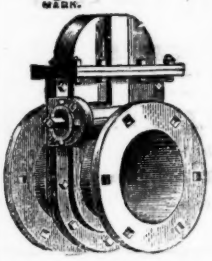

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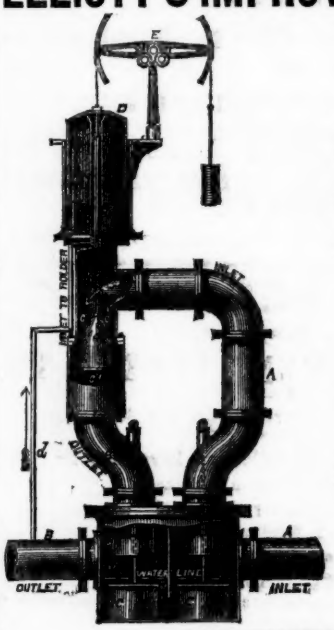

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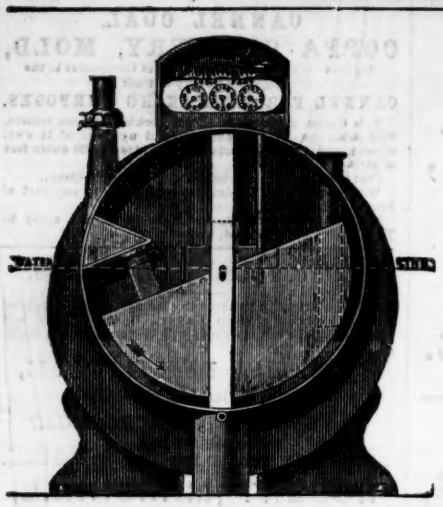

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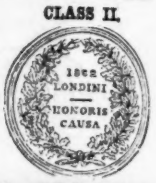

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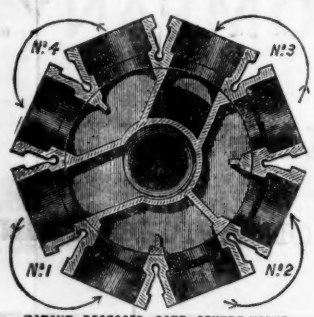

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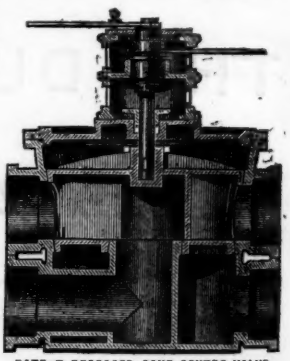

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